

**Proceedings of the American Academy of Arts and Sciences.**

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**RECORDS OF MEETINGS, 1905-1906.**

**REPORT OF THE COUNCIL: BIOGRAPHICAL NOTICES.**

**JAMES MUNSON BARNARD. BY WILLIAM R. WARE.**

**JOHN BARTLETT. BY M. H. MORGAN.**

**OFFICERS AND COMMITTEES FOR 1906-1907.**

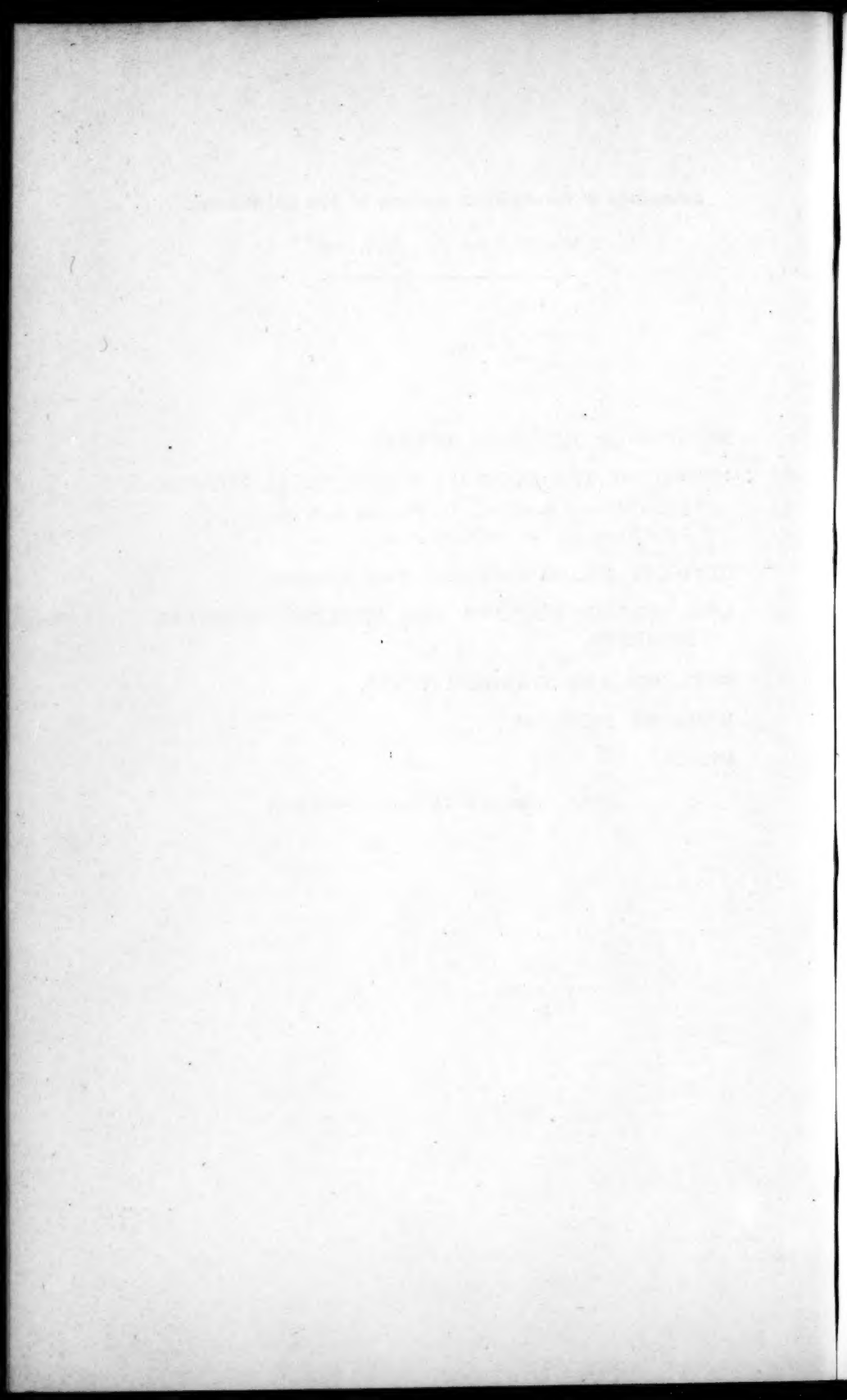
**LIST OF THE FELLOWS AND FOREIGN HONORARY  
MEMBERS.**

**STATUTES AND STANDING VOTES.**

**RUMFORD PREMIUM.**

**INDEX.**

**(TITLE PAGE AND TABLE OF CONTENTS.)**



## RECORDS OF MEETINGS.

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Nine hundred and fifty-ninth Meeting.

OCTOBER 11, 1905. — STATED MEETING.

The Academy met at the Jefferson Physical Laboratory, Cambridge.

The PRESIDENT in the chair.

There were present thirty-nine Fellows.

The Corresponding Secretary read the following letters : —

From Samuel Williston, accepting Fellowship; from Charles E. Munroe, acknowledging his election as Associate Fellow; from G. Stanley Hall, resigning Fellowship; from the University of Illinois, inviting delegates to the installation of Edmund J. James as President of the University; from Dr. Gustav Fischer, of Jena, soliciting subscriptions for a Memorial to Ernst Abbe; from the Société Entomologique de Belgique, announcing the celebration of its fiftieth anniversary and the publication of a Jubilee volume which will be given to the Academy; from the Directors of the Biblioteca Nazionale Centrale, of Florence, announcing the death of its Librarian, Comm. Desiderio Chilovi; from the Kön. böhmische Gesellschaft der Wissenschaften of Prag, announcing the death of its President, W. W. Ritt. von Tomek; from the Académie royale, d'Archeologie de Belgique Anvers, inviting Members of the Academy to be present at the celebration of the seventy-fifth anniversary of Belgian independence.

The Chair announced the following deaths : —

Edward S. Wood, Resident Fellow in Class I., Section 3;  
Otto Struve, Foreign Honorary Member in Class I., Section 1.

The following gentlemen were elected members of the Academy:—

Louis Bell, of Boston, to be a Resident Fellow in Class I., Section 2 (Physics).

Arthur Edwin Kennelly, of Cambridge, to be a Resident Fellow in Class I., Section 4 (Technology and Engineering).

Charles Gross, of Cambridge, to be a Resident Fellow in Class III., Section 3 (Political Economy and History).

Kuno Francke, of Cambridge, to be a Resident Fellow in Class III., Section 4 (Literature and the Fine Arts).

Herbert Langford Warren, of Cambridge, to be a Resident Fellow in Class III., Section 4.

Michael Idvorsky Pupin, of New York, to be an Associate Fellow in Class I., Section 2 (Physics).

Wilhelm Ostwald, of Leipzig, to be a Foreign Honorary Member in Class I., Section 3 (Chemistry).

Samuel Henry Butcher, of London, to be a Foreign Honorary Member in Class III., Section 4 (Literature and the Fine Arts), in place of the late Lesley Stephen.

Mr. A. Lawrence Lowell was appointed a delegate to attend the installation of Edmund J. James as President of the University of Illinois, at Urbana, October 17-19, 1905.

The following votes were passed:—

*Voted*, That the action of the President, William W. Goodwin, in executing in the name and behalf of the Corporation a party wall agreement with the owner of estate numbered 30 on Newbury Street in Boston, dated May 29th, 1905, be and the same hereby is ratified and confirmed as the act of the Corporation.

*Voted*, That the action of the Treasurer in paying bills for the current expenses of the Academy, in the absence of any appropriation therefor, be hereby approved and confirmed.

*Voted*, That an appropriation of three thousand dollars (\$3,000) be made for the General Expenses of the Academy, as of May, 1905, to be expended during the year 1905-1906.

*Voted*, That the Treasurer be authorized to sell and transfer any and all Stocks and Bonds belonging to the Academy,



with the written approval of one other member of the Finance Committee.

*Voted*, That the Treasurer be authorized to pay from the income of the General Fund one hundred and sixty dollars (\$160) for labels to be used in distributing the publications of the Academy.

*Voted*, That eight hundred dollars (\$800) be appropriated from the income of the Rumford Fund for publication and miscellaneous expenditures.

The Treasurer proposed certain amendments to the Statutes and Standing Votes:—

It was then *Voted*, That the draft of the Statutes and Standing Votes of the Academy, presented by the Treasurer, be referred to a Committee of five, consisting of the President, Recording Secretary, and Treasurer, together with two other members of the Academy, to be appointed by the President.

In accordance with the foregoing vote, the President appointed Professor Morris H. Morgan and Dr. Theodore Lyman members of the Committee to consider the revision of the Statutes and Standing Votes.

Professor John Trowbridge made a Communication on Slow Discharges of Electricity, with Experimental illustrations.

The following papers were presented by title:—

“On the Manner of Growth of a Current in a Nearly-Closed Electromagnet, as Influenced by the Width of the Air-gap.”  
By B. O. Peirce.

“Bibliography of the Hall Effect, with some Titles of Papers on Allied Phenomena.” By T. C. McKay. Presented by E. H. Hall.

“The Thermo-luminescence of Fluospar.” By H. W. Morse. Presented by John Trowbridge.

“Gaseous and Liquid Inclusions in Fluospar.” By H. W. Morse. Presented by John Trowbridge.

“Longitudinal Vibrations of Stretched Strings.” By H. N. Davis. Presented by John Trowbridge.

“The Fluorescence of Sodium Vapor and the Resonance Ra-

diation of Electrons." By Robert W. Wood. Presented by Charles R. Cross.

"On a Postulate respecting a Certain Form of Deviation from the Straight Line in a Plane." By Gustavus Hay.

"Slow Moving Electrical Luminous Effects." By John Trowbridge.

"Effect of Magnetic Field on Electric Discharges." By John Trowbridge.

Nine hundred and sixtieth Meeting.

NOVEMBER 8, 1905.

The Academy met at the house of Dr. Alexander Agassiz, Cambridge.

The PRESIDENT in the chair.

There were present eighty Fellows.

The Corresponding Secretary read the following letters:—

From the Sociedad Mexicana de Geografia y Estadistica, Mexico, inviting the Academy to participate in its celebration of the four hundredth anniversary of the birth of Christobal Colon, May 20, 1906; from Charles Gross, Kuno Francke, Herbert Langford Warren, and Albert Edwin Kennelly, accepting Resident Fellowship; from Michael Idvorsky Pupin, accepting Associate Fellowship; from Samuel Henry Butcher, accepting Foreign Honorary Membership; from William Everett, resigning Resident Fellowship; from Baroness von Richthofen, announcing the death of her husband; from the Gesellschaft für Erdkunde, Berlin, announcing a memorial service for Baron von Richthofen to take place October 29, 1905.

The Chair announced the death of Freiherr von Richthofen, Foreign Honorary Member in Class II., Section 1.

The following communications were given:—

"An Account of his Trip to the Eastern Pacific." By Professor Agassiz.

"The International Language, — Esperanto." By Professor Wilhelm Ostwald.

Remarks on Professor Ostwald's paper were made by Professors Morse and Lanman.

The following paper was presented by title:—

"The Electrostatic Field Surrounding Certain Columnar Elements." By P. W. Bridgman. Presented by B. O. Peirce.

Nine hundred and sixty-first Meeting.

DECEMBER 13, 1905.

The Academy met at the house of the President, in Cambridge.

The PRESIDENT in the chair.

There were present thirty-nine Fellows and one Foreign Honorary Member.

In the absence of the Recording Secretary, Professor M. H. Morgan was appointed Recording Secretary, *pro tempore*.

The President announced the following deaths:—

John Bartlett, Resident Fellow in Class III., Section 4;  
Edward Atkinson, Resident Fellow in Class III., Section 3.

The Corresponding Secretary read the following letters:—

From the Nobel Prize Committee, enclosing a circular relative to the prize in literature; and from Professor A. E. Dolbear, resigning Fellowship.

The following communications were given:—

Professor W. R. Ware—"Memoir of J. M. Barnard."

Professor W. M. Davis—"Notes on South Africa: the Dwyka Glacial Formation and the Karroo Basin Formation."

The following papers were presented by title:—

"The Expansibility and the Compressibility of Ether and of Alcohol in the Neighborhood of their Boiling Points." By Alpheus W. Smith. Presented by Edwin H. Hall.

"On Thermo-electric Heterogeneity in Various Alloys, especially German Silver." By Edwin H. Hall, L. L. Campbell, and S. B. Serviss.

"The Sense of Loudness." By W. C. Sabine.

"The Spectrum of Hydrogen in the Schumann Region of Short Wave Lengths." By Theodore Lyman.

"A Method of Determining Thermal Conductivity." By F. A. Laws, F. L. Bishop, and P. McJunkin.

"The Thermal Conductivity of Lead." By F. L. Bishop. Presented by F. A. Laws.

"The Transition Temperature of Sodid Bromide: a New Fixed Point in Thermometry." By T. W. Richards and R. C. Wells.

"A New Method of Standardizing Thermometers below Zero." By T. W. Richards and F. G. Jackson.

"On the Language of Vitruvius." By M. H. Morgan.

"Friction and Force due to Transpiration as Dependent on Pressure in Gases." By J. L. Hogg. Presented by John Trowbridge.

Nine hundred and sixty-second Meeting.

JANUARY 10, 1906. — STATED MEETING.

The Academy met in its house, 28 Newbury Street.

The PRESIDENT in the chair.

There were present thirty Fellows.

The President made a short address congratulating the Academy on having a home of its own.

The Corresponding Secretary read the following communications: —

From The Franklin Bicentennial Committee, inviting five members of the Academy to the exercises at Symphony Hall on Wednesday, January 17, 1906, in observance of the two hundredth anniversary of the birth of Benjamin Franklin; from G. Lecointe, Scientific Director of the Royal Observatory of Belgium, announcing a project of an International Association for the study of the Polar Regions, being the outcome of the Congress of Mons, held September 24, 1905.

The Committee on the Revision of the Statutes presented the following report: —

The Committee on the Revision of the Statutes of the American Academy respectfully submit a copy of the Revised Statutes and recommend their adoption in this form.

The changes made in the Statutes relate chiefly to the method of making Appropriations, to the approval and payment of Bills, and to the efficient management of the Treasurer's office. The Council is charged with the responsibility of reporting the Appropriations to the Academy, and for this purpose the Chairman of three Committees are made members of the Council in place of the three Vice-Presidents.

The calling of special Meetings is provided for, at which any action heretofore allowed at Stated Meetings may be taken.

Slight changes are made in the Nomination and Election of Fellows and Members, and a few verbal alterations are offered.

There has been a great disparity in the number of Resident Fellows belonging to each of the three Classes, and an Amendment to the Statutes is submitted to remedy this trouble.

The distribution of the publications of the Academy has been omitted from the Statutes and is authorized by the Standing Votes in which few changes have been made.

(Signed) W. W. GOODWIN.  
M. H. MORGAN.  
CHARLES P. BOWDITCH.  
WM. WATSON.  
THEODORE LYMAN.

Boston, January 10, 1906.

The Academy then proceeded to consider in detail the proposed changes in the Statutes.

Chapters I., III., IV., V., VI., VIII., IX., and XI., of the Statutes, and Nos. 2 and 8 of the Standing Votes were unanimously approved, but such marked differences of opinion were expressed in the discussion of Chapters II. and VII. that at the suggestion of the President the discussion of these changes was deferred to the meeting of February 14, and on the motion of the Recording Secretary, it was

*Voted*, To meet on adjournment February 14.

Professor Trowbridge then made the following communication: "Effect of Magnetic Field on Production of the X Rays."

At the request of the President, Dr. Bell gave a brief description of the electric lights just installed in the building, which were quite novel in character.

On motion of Professor W. M. Davis, a House Committee was established; the President appointed Messrs. Ware, Morgan, and Rotch as this Committee.

On motion of Professor Webster it was

*Voted*, That the thanks of the Academy be tendered to the Committee for their services in preparing this building for occupancy.

Nine hundred and sixty-third Meeting.

FEBRUARY 14, 1906. — ADJOURNED STATED MEETING.

The PRESIDENT in the chair.

There were present twenty-seven Fellows.

The Corresponding Secretary read the following letters:

From Freifrau von Richthofen, in appreciation of messages of sympathy on the death of her husband; from the Academy of Science of St. Louis, inviting the Academy to be represented at a dinner commemorative of its fiftieth anniversary, to be given March 10, 1906; from the American Philosophical Society, inviting the Academy to participate in the celebration of the two hundredth anniversary of the birth of Benjamin Franklin, to be held in Philadelphia on April 17, 18, 19, and 20, 1906; from the Royal Geographical Society of Australasia, Queensland, inviting the Academy to take part in the celebration of its twenty-first anniversary, to take place in June, 1906; from the Treasurer of the Leidy Memorial Committee, asking contributions for a Memorial to Dr. Joseph Leidy, to be presented to the city of Philadelphia; from the Königlich böhmische Gesellschaft der Wissenschaften, announcing the death of Karl Ritter von Koristka.

On the motion of Professor Webster it was

*Voted*, That Professor W. Trelease, of St. Louis, be requested to represent the Academy at the fiftieth anniversary of the Academy of Science of St. Louis. It was also

*Voted*, That the President be empowered to appoint delegates to represent the Academy at the celebration of the birth of Franklin, by the American Philosophical Society in April; and



to the celebration of the twenty-first anniversary of the Royal Geographical Society of Australasia.

The President announced the death of A. von Kölliker, Foreign Honorary Member in Class II., Section 3.

The Amendments to the Statutes not acted upon at the last meeting were then considered. The proposed amendments to Chapter II. were rejected. A new paragraph to Chapter X., equalizing the number of Resident Fellows in the three Classes, was also rejected.

It was then

*Voted*, To amend the Statutes and Standing Votes, as follows:—

Ch. I., Sec. 1. The word "Theology" inserted before the words "Philosophy and Jurisprudence."

Ch. III., Sec. 1. Omit in the first line the clause "from the next retiring Councillors."

Ch. IV., Sec. 1. For the clause "to summon extraordinary meetings upon any urgent occasion" substitute the phrase "to direct the Recording Secretary to call special meetings."

Ch. IV., Sec. 2. Omit.

Ch. IV., Sec. 3. To be numbered "2."

Ch. IV., Sec. 4. To be numbered "3."

Ch. V., Sec. 2. Omit the last sentence.

Ch. V., Sec. 3. Add the following sentence: "All bills incurred on account of the Rumford Fund, within the limits of the appropriation made by the Academy, shall be approved by the Chairman of the Rumford Committee."

Ch. V., Sec. 4. Add the following sentence: "All bills incurred on account of the C. M. Warren Fund, within the limits of the appropriations made by the Academy, shall be approved by the Chairman of the C. M. Warren Committee."

Ch. V., Sec. 5. Add the following sentences: "This Committee shall report to the Council in March of each year on the appropriations needed for the coming year. All bills incurred on account of publications, within the limits of the appropriations made by the Academy, shall be approved by the Chairman of the Committee on Publication."



Ch. V., Sec. 6. Add the following sentences: "This Committee, through the Librarian, shall report to the Council in March of each year, on the appropriations needed for the Library for the coming year. All bills incurred on account of the Library, within the limits of the appropriations made by the Academy, shall be approved by the Librarian."

Ch. V., Sec. 7. The President and Recording Secretary shall be a Committee on the general expenditures of the Academy. This Committee shall report to the Council in March of each year on the appropriations needed for the general expenditures for the coming year, and either member of the Committee may approve bills incurred on this account within the limits of the appropriations made by the Academy.

Ch. V., Sec. 8. An auditing Committee, to consist of two Fellows, for auditing the accounts of the Treasurer, with power to employ an expert and to approve his bill.

Ch. V., Sec. 9. In the absence of the Chairman of any Committee, bills may be approved by a member of the Committee designated by the Chairman for the purpose.

Ch. VI., Sec. 1. In line 6 omit the words "for nomination."

Ch. VI., Sec. 4. "Every person taking any books, papers, or documents belonging to the Academy and in the custody of the Recording Secretary, shall give a receipt for the same to the Recording Secretary."

Ch. VII., Sec. 2. Read as follows after the first sentence:—

"He shall pay all bills due by the Academy, when approved by the proper officers (except those of the Treasurer's office, which may be paid without such approval). He shall sign all leases of real estate in the name of the Academy. All transfers of stocks, bonds, and other securities belonging to the Academy shall be made by the Treasurer with the written consent of one member of the Committee of Finance. He shall keep an account of all receipts and expenditures, shall submit his accounts annually to the Auditing Committee, and shall report the same at the expiration of his term of office or whenever called on so to do by the Academy or Council."

Ch. VII., Sec. 4. To be omitted.

Ch. VII., Sec. 5. To be numbered "4."

Chap. VIII., Sec. 2. Add "periodicals, etc." after "books" in line four.

Ch. VIII., Sec. 7. Omit in the second line of the first sentence all after "Academy."

Ch. IX., Sec. 1. After the word "notified" in line five insert the words "or at special meetings called for the purpose," and add the following paragraph:—

"Special meetings shall be called by the Recording Secretary at the request of the President or of a Vice-President or of five Fellows. Notifications of the special meetings shall contain a statement of the purpose for which the meeting is called."

Ch. IX., Sec. 2. Insert the word "Resident" before "Fellows" in line one. Insert the words "or special" after "stated," in line two.

Chap. IX., Sec. 3. Insert the word "Resident" before "Fellow" in line two and omit the words "residing in Boston or the vicinity."

Ch. X., Sec. 2. Omit the words "for nomination" in line five. Omit the word "written" in line seven. Substitute "any" for "stated" in line nine. In the tenth line substitute for the words "during the interval between two stated meetings" the words "until the next stated meeting."

Ch. X., Sec. 6. Omit.

Chap. X., Sec. 7. To be numbered "6."

Ch. XI., Sec. 1, Line 2. For the word "meeting" substitute "stated meeting, or a special meeting called for the purpose."

#### *Standing Votes.*

Vote 2, Line 1. Prefix the words, "Associate Fellows, Foreign Honorary Members and" to the word "Resident."

Omit the second sentence. Add, "Exceptions to this rule may be made in special cases by vote of the Academy."

Vote 8. Add the clause: "and the approval of a bill incurred for such purposes by the Chairman shall be accepted by the Treasurer as proof that such certificate has been given."

On motion of Professor Webster it was

*Voted*, That the sum of five hundred and fifty dollars (\$550) be appropriated from the income of the Rumford Fund for the immediate use of the Rumford Committee.

Professor E. H. Hall proposed certain amendments to the Statutes. In accordance with Chapter XI. of the Statutes, these proposed amendments were referred to the following Committee:—

The President, Corresponding Secretary, Recording Secretary, Treasurer, Professor Morgan, and Dr. Lyman.

The following communications were given:—

“Results of the Franco-American Expedition to explore the Atmosphere in the Tropics.” By A. Lawrence Rotch.

“Comparison of Lunar and Hawaiian Craters.” By W. H. Pickering.

The following papers were presented by title:—

“The Longitudinal Vibrations of a Rubbed String.” By Harvey N. Davis. Presented by W. C. Sabine.

“On the Inconsistency of the Axiom of the Plane with the Supposition that the Sum of the Angles of the Rectilinear Triangle is less than  $180^\circ$ .” By G. Hay.

“The Effects of Interbreeding, Crossbreeding, and Selection upon the Fertility and Variability of *Drosophila*.” By W. E. Castle, F. W. Carpenter, A. H. Clark, S. O. Mast, and M. W. Barrows.

“On the Length of the Time of Contact in the Case of a Quick Tap on a Telegraph Key.” By B. O. Peirce.

“On the Permeability and the Retentiveness of a Mass of Fine Iron Particles.” By B. O. Peirce.

Nine hundred and sixty-fourth Meeting.

March 14, 1906.—STATED MEETING.

The Academy met at its house, 28 Newbury Street.

The PRESIDENT in the chair.

There were present eighteen Fellows.

In the absence of the Recording Secretary, W. M. Davis was appointed Recording Secretary, *pro tempore*.

The President announced the death of Professor Samuel Pierpont Langley, Associate Fellow in Class I., Section 2.

The Corresponding Secretary read a letter from M. P. Porzild, Director of the Danish Artic Station at Disco, Greenland, requesting contributions of publications on Arctic nature and biology.

The Chair announced that in accordance with a vote of the last meeting, the Academy would be represented at the Franklin celebration of the American Philosophical Society by the President and Professor W. M. Davis.

The following gentlemen were elected members of the Academy:—

Comfort Avery Adams, of Cambridge, to be a Resident Fellow in Class I., Section 4 (Technology and Engineering).

Edward Charles Jeffrey, of Cambridge, to be a Resident Fellow in Class II., Section 2 (Botany).

Walter Bradford Cannon, of Cambridge, to be a Resident Fellow in Class II., Section 3 (Zoölogy and Physiology).

Joseph Henry Beale, Jr., of Cambridge, to be a Resident Fellow in Class III., Section 1 (Philosophy and Jurisprudence).

George Foot Moore, of Cambridge, to be a Resident Fellow in Class III., Section 2 (Philology and Archaeology).

Albert Andrew Howard, of Cambridge, to be a Resident Fellow in Class III., Section 2 (Philology and Archaeology).

Thomas Nixon Carver, of Cambridge, to be a Resident Fellow in Class III., Section 3 (Political Economy and History).

Charles Benedict Davenport, of Cold Spring Harbor, N. Y., to be an Associate Fellow in Class II., Section 3 (Zoölogy and Physiology). Transferred from Resident Fellowship.

The Chair appointed the following gentlemen to serve as Nominating Committee:—

E. H. Bradford, J. H. Wright, L. J. Johnson.

In accordance with the report of the Committee appointed February 14, 1906, to whom were referred certain alterations of the Statutes, it was

*Voted*, To amend the Statutes as follows:—

Chap. I., Sec. 2. After the word "hundred," in the first line, insert the phrase "of whom there shall not be more than eighty in any one of the three classes."

Chap. II., Sec. 2. To read as follows:—

"There shall be nine Councillors, chosen from the Resident Fellows. At each annual meeting, three Councillors shall be chosen, by ballot, one from each Class, to serve for three years; but the same Fellow shall not be eligible for two successive terms. The nine Councillors, with the President, the three Vice-Presidents, the two Secretaries, the Treasurer, and the Librarian, shall constitute the Council. Five members shall constitute a quorum. It shall be the duty of this Council to exercise a discreet supervision over all nominations and elections. With the consent of the Fellow interested, they shall have power to make transfers between the several Sections of the same Class, reporting their action to the Academy."

Chap. II., Sec. 3. To read as follows:—

"The Council shall at its March Meeting receive reports from the Rumford Committee, the C. M. Warren Committee, the Committee on Publication, the Committee on the Library, the President and Recording Secretary, and the Treasurer, proposing the appropriations for their work during the year beginning the following May. The Treasurer at the same meeting shall report on the income which will probably be received on account of the various Funds during the same year.

"At the Annual Meeting, the Council shall submit to the Academy, for its action, a report recommending the appropriations, which in the opinion of the Council should be made for the various purposes of the Academy."

Chap. II., Old Sec. 3. To be numbered 4.

Chap. X., Sec. 3. To read as follows:—

"The nomination and election of Associate Fellows shall take place in the manner prescribed in reference to Resident Fellows."

Chap. X., Sec. 4. To read as follows:—

"The nomination and election of Foreign Honorary Members



shall take place in the manner prescribed for Resident Fellows, except that the nomination papers shall be signed by at least seven members of the Council before being presented to the Academy."

It was then

*Voted*, To meet on adjournment April 11, 1906.

Professor M. L. Fernald gave a communication on "Soil and Climatic Control of Plant Distribution in Eastern America."

Professor Barrett Wendell spoke on the "Universities of France."

The following papers were presented by title:—

"On the Conditions to be satisfied if the Sums of the Corresponding Members of two Pairs of Orthogonal Functions of  $x$  and  $y$  are to be themselves Orthogonal." By B. O. Peirce.

"On the Correction for the Effect of the Counter Electromotive Force of a Moving-Coil Galvanometer used Ballistically." By B. O. Peirce.

"The Accuracy of Musical Taste with Respect to Architectural Acoustics." By Wallace C. Sabine.

"Variation in Reverberation with Variation in Pitch." By Wallace C. Sabine.

"Athenian Lekythoi with Outline Drawing in Glaze Varnish on a White Ground." By Arthur Fairbanks. Presented by John H. Wright.

"A Theory of Thermo-Electric Action." By Edwin H. Hall.

"Studies in the Eupatorieae. I. Revision of the Genus *Piqueria*. II. Revision of the Genus *Ophryosporus*. III. The Genus *Helogyne* and its Synonyms. IV. Diagnoses and Synonymy of Eupatorieae and of Certain Other Compositae which have been classed with them." By B. L. Robinson.

Nine hundred and sixty-fifth Meeting.

APRIL 11, 1906. — ADJOURNED STATED MEETING.

The Academy met at its house, 28 Newbury Street.

VICE-PRESIDENT TROWBRIDGE in the chair.

There were present twenty-four Fellows.

The Corresponding Secretary read the following letters:—

From Professor Trelease, of St. Louis, giving an account of the discharge of his duties as the representative of the Academy at the celebration of the fiftieth anniversary of the Academy of Science of St. Louis; from Joseph H. Beale, Walter B. Cannon, George F. Moore, and E. C. Jeffrey, accepting Resident Fellowship; from Wilhelm Ostwald, accepting Foreign Honorary Membership; from F. W. Draper, resigning Fellowship; from the Smithsonian Institution, announcing the death of its Secretary, Samuel P. Langley.

The Chair announced the following deaths:—

Professor James M. Peirce, Resident Fellow in Class I., Section 1; Professor Nathaniel S. Shaler, Resident Fellow in Class II., Section 1.

The Corresponding Secretary moved and it was

*Voted*, That the request made by M. P. Porzild, for publications on Arctic nature and biology, be referred to the Library Committee.

A communication was given by Dr. Louis Bell on "Some Modern Illuminants and the Mechanical Theory of Light."

A communication was also given by Professor W. M. Davis on "The Desirability of a General Annual Meeting of New England Investigators."

At the conclusion of Professor Davis's remarks it was

*Voted*, that the question of a General Annual Meeting of the Academy and guests be referred to the Council.

The following paper was presented by title:—

"On a simple Device for Measuring the Deflections of a Mirror Galvanometer." By B. O. Peirce.

Nine hundred and sixty-sixth Meeting.

MAY 9, 1906. — ANNUAL MEETING.

The Academy met at its house, Newbury Street.

The PRESIDENT in the chair.

There were present twenty-six Fellows.

The Corresponding Secretary read a communication from the



Société d'Emulation d'Abbeville, asking contributions for a monument in honor of Boucher de Perthes.

The annual report of the Council was read.\*

The annual report of the Treasurer was read, of which the following is an abstract:—

At the beginning of the year 1905–1906, a new system of accounts was adopted. The building No. 28 Newbury Street having been bought at a cost in excess of the amount of the Building Fund, this account was transferred to the General Fund. The balance of the General Fund Income was carried to principal, and the General Fund was reduced by setting off to the Publication Fund the sums which had been given for publication purposes.

GENERAL FUND.

*Receipts.*

Investments . . . . .	\$2,553.51	
Assessments . . . . .	1905.00	
Admission fees . . . . .	120.00	
Rent of offices . . . . .	250.00	
Sundries . . . . .	10.00	\$4,838.51
Deficit . . . . .		<u>173.47</u>
		\$5,011.98

*Expenditures.*

General expenses . . . . .	\$3,424.06	
Library . . . . .	<u>1,587.92</u>	\$5,011.98

RUMFORD FUND.

*Receipts.*

Balance April 30, 1905 . . . . .		\$191.20
Investments . . . . .		3,259.42
		<u>\$3,450.62</u>

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\* See p. 837.

*Expenditures.*

Research . . . . .	\$1,400.00	
Publication . . . . .	1,174.67	
Library . . . . .	157.09	
Publishing Rumford Pamphlets . . . . .	229.03	
Miscellaneous . . . . .	38.60	\$2,999.39
Balance April 30, 1906 . . . . .		451.23
		<u>\$3,450.62</u>

## C. M. WARREN FUND.

*Receipts.*

Balance April 30, 1905 . . . . .	\$667.13
Investments . . . . .	330.93
	<u>\$998.06</u>

*Expenditures.*

Vault rent . . . . .	\$8.00	
Premium on bonds . . . . .	50.00	\$58.00
Balance April 30, 1906 . . . . .		940.06
		<u>\$998.06</u>

## PUBLICATION FUND.

*Receipts.*

Investments . . . . .	\$2,677.03	
Sale of Publications . . . . .	92.58	\$2,769.61

*Expenditures.*

Publication . . . . .	\$1,761.68	
Premium on bonds . . . . .	21.25	
Vault rent . . . . .	25.00	\$1,807.93
Balance April 30, 1906 . . . . .		961.68
		<u>\$2,769.61</u>

The following reports were also presented : —

REPORT OF THE LIBRARIAN.

The most important feature of the year was the removal of the Library from the third story of the Massachusetts Historical Society building to the new home of the Academy, Number 28 Newbury Street. This building (except the stack) was occupied in December, but the books were not moved until January and February of this year. Great care was taken by the movers, — Moore & Co., — and the placing of the books in the fireproof stack in the rear of the building and the current numbers of periodicals in the steel cases in the Meeting-room was successfully accomplished through the careful supervision of Mrs. Holden, the Assistant Librarian. In the same way the large stock of publications of the Academy was transferred during April to the basement of the building, but this must be regarded as a temporary arrangement only. The cost of moving the Library and belongings, which has been charged to the Building Fund, was \$525.83.

The accessions during the year have been as follows : —

	Vols.	Parts of Vols.	Pamph.	Maps.	Total.
By gift and exchange . . . . .	237	2280	227	5	2749
By purchase — General Fund . . .	16	1228			1244
By purchase — Rumford Fund . . .	8	376			384
Total . . . . .	261	3861	227	5	4377

3 volumes recommended by the Rumford Committee were purchased at an expense of \$13.03 from the special appropriation of \$50 for books.

84 books have been borrowed from the Library by 27 persons, including 13 Fellows, and one Library (Clark University Library). The Library has been consulted many times when no books were taken.

Of the books borrowed, all have been returned for the annual examination except 10 (taken out by two people). Of the 8 volumes reported missing a year ago, all have been returned.

The expenses charged to the Library are as follows: Miscellaneous, \$587.92; Binding, \$482.50, General, and \$35.20, Rumford Funds; Subscriptions, \$416.25, General, and 108.86, Rumford Funds; making a total of \$1486.67 for the General and 144.06 for the Rumford Funds.

It is impossible for one person to properly care for a library of this

size in addition to the duties of the Assistant Librarian required by the business of the Society, and it is hoped that the type-written catalogue, left unfinished by the death of Dr. Holden, can be completed this year by an experienced cataloguer. It will soon be necessary to re-bind a large number of sets of books, which, owing to the perishable nature of the bindings formerly used, are now crumbling away.

A. LAWRENCE ROTCH, *Librarian*.

MAY 9, 1906.

#### REPORT OF THE RUMFORD COMMITTEE.

From the appropriation of \$1000 in aid of research voted at the last annual meeting, grants have been made to the following persons in aid of the researches specified.

October 11, 1905. Arthur B. Lamb, of Harvard University, Specific Heat of Salt Solutions, \$200.

December 13, 1905. John A. Parkhurst, of the Yerkes Observatory, for the purchase of a Hartmann photometer, \$225.

Professor Charles B. Thwing, of Syracuse University, Thermo-Electric Power of Metals (second appropriation), \$400.

March 14, 1906. Professor Edwin H. Hall, of Harvard University, Thermo-Electric Properties of Metals, \$100.

Professor Frederic E. Kester, of the Ohio State University, Joule-Thomson Effect in Gases, \$50.

April 11, 1906. Professor Edwin H. Hall, of Harvard University, Thermo-Electric Properties of Metals (additional), \$25.

The appropriation of \$100, made in 1903 to Professor Sidney D. Townley for the construction of a stellar photometer has been returned to the Treasurer of the Academy, as a change of location precludes carrying out the investigation which he had planned.

The investigation of Professor Dewitt B. Brace on Double Refraction in Gases in an Electrical Field, for which grants had been made amounting to \$400, has been brought to a close by his sudden death. The appropriation had been mostly expended in the construction of apparatus, and it is hoped that the research begun by him may be prosecuted by one of his colleagues.

The pamphlet, relative to the scientific results which have been obtained by the application of the bequest of Count Rumford, referred to in the last Annual Report as in press, has been issued, and copies have been sent to a large number of physicists.

The following papers have been published at the expense of the Rumford Fund during the past year, the first mentioned in the Memoirs of the Academy, the others in the Proceedings.

"The Spectrum of Hydrogen in the Region of Extremely Short Wave-Length." By Theodore Lyman.

"Report of an Experiment to detect the FitzGerald-Lorentz Effect." By Edward W. Morley and Dayton C. Miller.

"Surface Tension at the Interface between Certain Liquids and Vapors." By Arthur L. Clark.

"The Transition Temperature of Sodium Bromide: a New Fixed Point in Thermometry." By Theodore W. Richards and Roger C. Wells.

"A New Method of Standardizing Thermometers below 0°C." By Theodore W. Richards and Frederick G. Jackson.

"A Method of determining Thermal Conductivity." By F. A. Laws with F. L. Bishop and P. McJunkin.

"On Thermo-Electric Heterogeneity in Certain Alloys, especially German-Silver." By Edwin H. Hall, L. L. Campbell, and S. B. Serviss.

"Studies on Fluorite."

1. The Fluorescence of Fluorite.
2. The Thermo-Luminescence of Fluorite.
3. Gaseous and Liquid Inclusions in Fluorspar. By Harry W. Morse.

"The Elimination of Thermometric Lag and Accidental Loss of Heat in Calorimetry." By Theodore W. Richards, Lawrence J. Henderson, and George S. Forbes.

1. Two New Methods of avoiding Error in Calorimetry. By Theodore W. Richards.
2. The Constancy of Results obtained by one of the New Methods. By Theodore W. Richards and George S. Forbes.
3. The Comparison of the two Methods, and the Exact Estimation of Adiabatic Rise of Temperature. By Theodore W. Richards and Lawrence J. Henderson.

"Measurement of Various Thermal and Electrical Effects, especially the Thomson Effect in Soft Iron." By Edwin H. Hall, Messrs. Churchill, Campbell, and Serviss.

"Thermal Expansion of Hydrogen and Carbon Dioxide under Constant Pressure." By Theodore William Richards and Kenneth Lamartine Mark.

"The Relative Positions of the Arc and Spark Lines of the Spectra of Titanium, Zinc, and Iron." By Norton A. Kent.

Also reports of progress of researches not yet ready for publication have been received from Messrs. Frederic L. Bishop, John A. Dunne, William J. Humphreys, Ralph S. Minor, Charles B. Thwing, John Trowbridge, Robert W. Wood.

The expenditures of the past year for publication have been much in excess of the ordinary amount. This is due chiefly to the unusually large number of papers which have been presented, mostly based on researches aided by the Rumford Fund. Appropriations, amounting to \$1350, have been made by the Academy to meet this expense.

The Committee has given much thought to the question of an award of the Rumford Premium, and has considered the claims of several persons, but has no recommendation to make for the present year.

CHAS. R. CROSS, *Chairman*.

MAY 9, 1906.

#### REPORT OF THE C. M. WARREN COMMITTEE.

The C. M. Warren Committee begs leave to report that the Committee recommended no grants from the Warren Fund during the past year. This was due to the fact that the income received from the fund in 1904 was very small, owing, it is said, to changes and additions that were being made to the Warren Asphalt Plant.

Respectfully submitted,

LEONARD P. KINNICUTT, *Chairman*.

MAY 9, 1906.

#### REPORT OF THE PUBLICATION COMMITTEE.

During the period beginning May 1, 1905, and ending April 30, 1906, two numbers of the Proceedings, Volume XL. (Nos. 23 and 24), and thirty-two numbers of Volume XLI. have been published, likewise one biographical notice, making in all 820 pages and 14 plates. Thirteen numbers of the Proceedings (Volume XLI., Nos. 1, 2, 5, 6, 10, 12, 16, 20, 21, 22, 25, and 27) were paid for out of the income of the Rumford Fund.

One number of the Memoirs (Volume XIII., No. 3, pp. 121-146, plates III.-VIII.) has been published at the expense of the Rumford Fund.

The unexpended balance of appropriations from the General Fund for publications on May 1, 1905, was \$278.55; the appropriation for the year 1905-06, \$2,400, and the receipts from sales of publications \$92.58



making the whole amount available for publications \$2,771.13. The expenditures for publications have been from the General Fund \$1,761.68, leaving an unexpended balance from the General Fund of \$1,009.45. The expenditures on account of the income from the Rumford Fund have been \$1,174.67.

Beginning with Volume XLII., the Proceedings will be printed from newer and better type, and at the top of the cover the volume and number will be indicated in bold Arabic numerals, to aid the Librarian in the distribution of copies.

E. L. MARK, *Chairman.*

MAY 9, 1906.

#### FINANCIAL REPORT OF THE COUNCIL.

The income, for the year 1906-07, as estimated by the Treasurer, is as follows:—

General Fund . . .	{	Investments . . . . .	\$1510	
		Assessments . . . . .	1800	
		Rent of offices . . . . .	1200	\$4510
Publication Fund . . .	{	Appleton Fund investments . .	\$ 536	
		Centennial Fund investments . .	2111	\$2647
Rumford Fund . . .	Investments . . . . .		\$2511	
C. M. Warren Fund . .	Investments . . . . .		280	

The following appropriations are recommended:—

#### GENERAL FUND.

House expenses . . . . .	\$1400	
Library expenses . . . . .	1400	
Books, periodicals, and binding . . . . .	900	
Expenses of Meetings . . . . .	250	
Insurance . . . . .	75	
Treasurer's office . . . . .	150	\$4175



## RUMFORD FUND.

Research . . . . .	\$1000	
Periodicals and binding . . . . .	150	
Books and binding . . . . .	50	
Publication . . . . .	700	
To be used at discretion of Committee . . . . .	250	\$2150

## C. M. WARREN FUND.

Research . . . . .	\$600
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## PUBLICATION FUND.

Publication . . . . .	\$2600
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In accordance with the recommendations in the foregoing report it was

*Voted*, To appropriate for the purposes named, the following sums:—

From the income of the General Fund . . . . .	\$4175
From the income of the Rumford Fund . . . . .	2150
From the income of the C. M. Warren Fund . . . . .	280
From the accumulated income of the C. M. Warren Fund . . . . .	320
From the income of the Publication Fund . . . . .	2600

On the motion of the Treasurer, it was

*Voted*, That the annual assessment for the ensuing year be ten dollars (\$10).

The Corresponding Secretary proposed that the Statutes be so changed as to permit the establishment of a Retired list, which proposition was referred to the Council.

The following report of the Committee on the Library was read:—

The Committee on the Library desire to submit through the Librarian, the following recommendation to be acted upon by the Academy: That the Librarian be authorized, at his discretion, to dispose of, through sale, exchange, or gift, such volumes as are not germane to the purposes of this Library. Exceptions are to be made in the case of copies presented

by the authors, other than those received under the Bowdoin bequest, which under the terms of the bequest may be sold.

The Committee desire the opinion of the Academy concerning the disposition of a valuable work, written by John Eliot in the Indian language, of which the value exceeds two hundred dollars.

On motion of the Librarian it was,

*Voted*, That the Librarian be authorized to dispose of such books as are not germane to the purposes of this Library.

Inasmuch as the Massachusetts Historical Society has refused to charge any rent for the use of the Academy rooms in its building for the past year, it was

*Voted*, To present to the Massachusetts Historical Society certain volumes which have been selected by the Library Committee, in grateful recognition of the action of that Society.

The annual election resulted in the choice of the following officers and committees :—

WILLIAM W. GOODWIN, *President*.

JOHN TROWBRIDGE, *Vice-President for Class I.*

HENRY P. WALCOTT, *Vice-President for Class II.*

JOHN C. GRAY, *Vice-President for Class III.*

EDWIN H. HALL, *Corresponding Secretary.*

WILLIAM WATSON, *Recording Secretary.*

CHARLES P. BOWDITCH, *Treasurer.*

A. LAWRENCE ROTCH, *Librarian.*

*Councillors for Three Years.*

IRA N. HOLLIS, of Class I.

JAMES C. WHITE, of Class II.

WILLIAM R. WARE, of Class III.

*Councillor for One Year.*

In place of JOHN H. WRIGHT, resigned,

CHARLES R. LANMAN.

*Finance Committee.*

WILLIAM W. GOODWIN,  
ELIOT C. CLARKE,  
FRANCIS BARTLETT.

*Rumford Committee.*

CHARLES R. CROSS,      ERASMUS D. LEAVITT,  
EDWARD C. PICKERING,      ARTHUR G. WEBSTER,  
THEODORE W. RICHARDS,      ELIHU THOMSON,  
LOUIS BELL.

*C. M. Warren Committee.*

LEONARD P. KINNICUTT,      ROBERT H. RICHARDS,  
SAMUEL CABOT,      ARTHUR M. COMEY,  
ARTHUR MICHAEL,      HENRY P. TALBOT,  
CHARLES R. SANGER.

The following standing committees were appointed by the  
Chair: —

*Publication Committee.*

WALLACE C. SABINE, of Class I., EDWARD L. MARK, of Class II.,  
CRAWFORD H. TOY, of Class III.

*Library Committee.*

HARRY M. GOODWIN, of Class I., SAMUEL HENSHAW, of Class II.,  
HENRY W. HAYNES, of Class III.

*Auditing Committee.*

A. LAWRENCE LOWELL,      FREDERICK J. STIMSON.

The following communications were given: —

“Delphi.” By Professor W. W. Goodwin.

“Studies in the Text of Plato’s Republic.” By Professor  
J. H. Wright.

The following papers were presented by title: —

“On the Convergence and the Differentiation of Certain

Classes of Trigonometric Series." By W. C. Brenke. Presented by Maxime Bôcher.

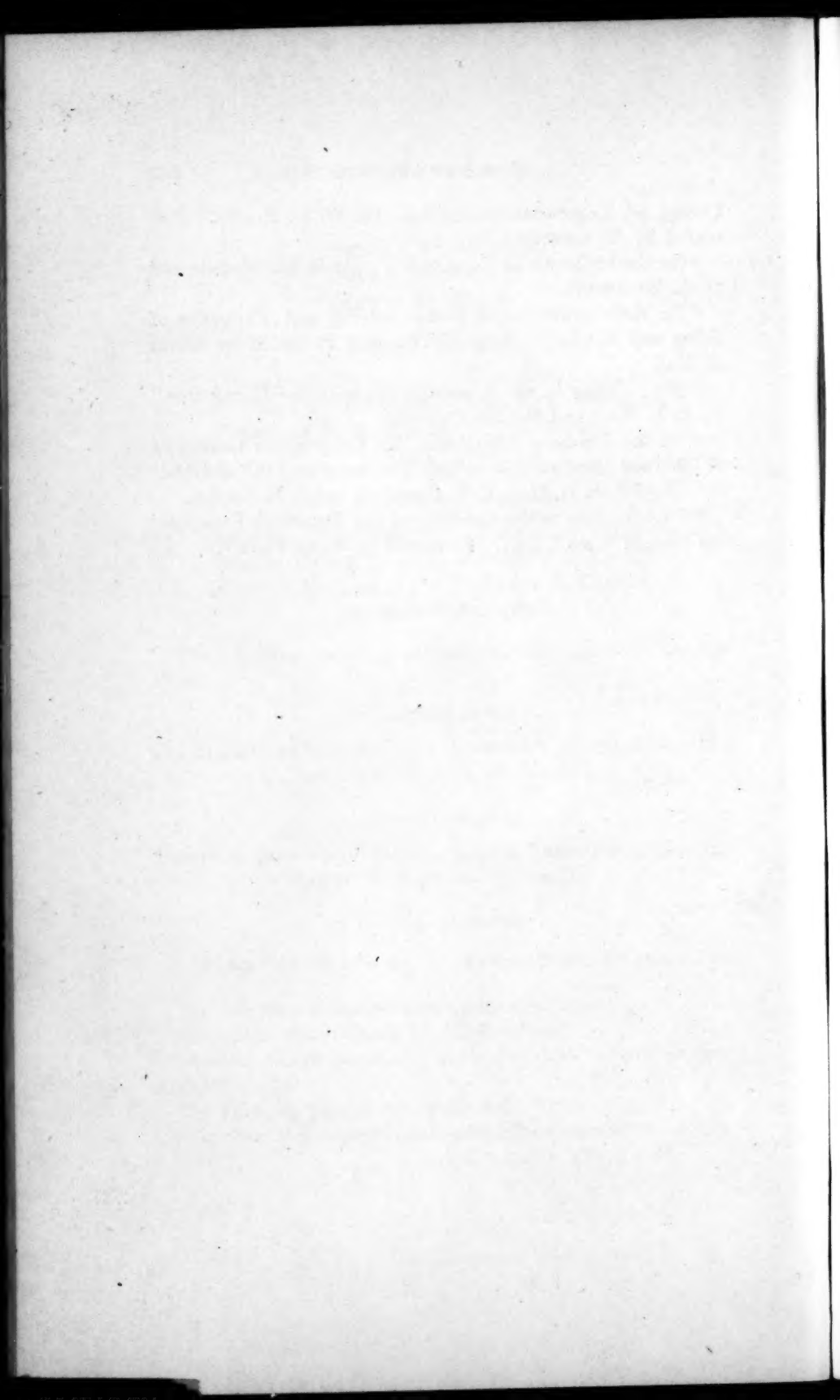
"On the Ionization of Fused Salts." By H. M. Goodwin and H. A. Wentworth.

"On the Coefficients of Compressibility and Expansion of Ether and Alcohol." By A. W. Smith. Presented by Edwin H. Hall.

"Some Stages in the Spermatogenesis of the Honey Bee." By E. L. Mark and Manton Copeland.

"On the Thomson Effect and the Temperature Coefficient of Thermal Conductivity in Soft Iron between 114° and 204° C." By Edwin H. Hall, L. L. Campbell, and S. B. Serviss.

"Contributions to the Cytology of the Entomophthoraceae." By Lincoln Ware Riddle. Presented by W. G. Farlow.



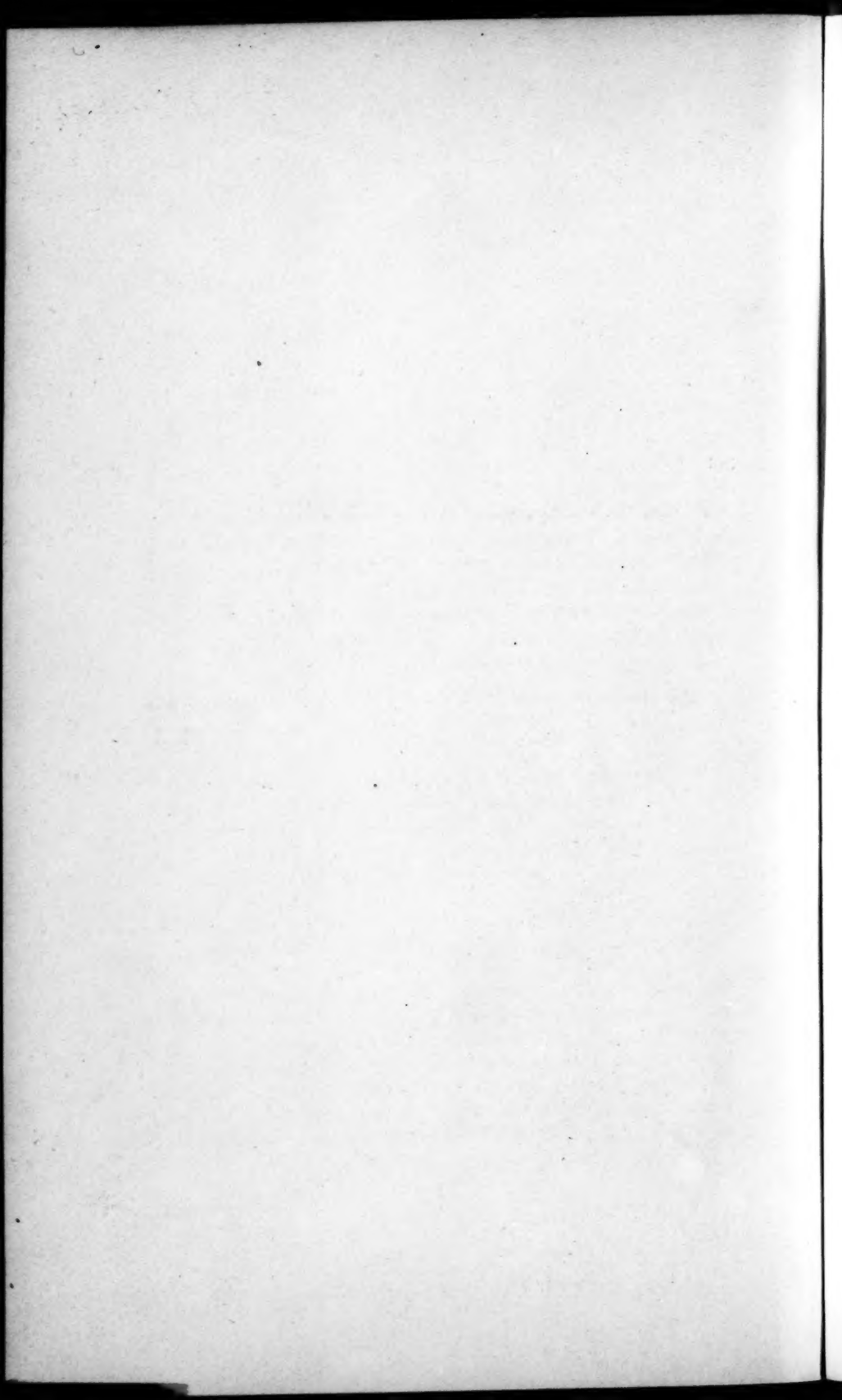
AMERICAN ACADEMY OF ARTS AND SCIENCES.



REPORT OF THE COUNCIL.—PRESENTED MAY 9, 1906.

BIOGRAPHICAL NOTICES.

JAMES MUNSON BARNARD. . . . . WILLIAM R. WARE.  
JOHN BARTLETT . . . . . M. H. MORGAN.





## REPORT OF THE COUNCIL.

The Academy has lost nine members by death since the last report of the Council at the Annual Meeting of May 10, 1905:—

Five Resident Fellows: Edward Atkinson, John Bartlett, James Mills Peirce, Nathaniel S. Shaler, and Edward S. Wood; one Associate Fellow: Samuel P. Langley; three Foreign Honorary members: Otto Struve, Freiherr von Richthofen, A. von Kölliker. Four resident Fellows have resigned; one Resident Fellow has been transferred to Associate Fellowship.

New members have been elected as follows:—

Resident Fellows, 12; Associate Fellows, 1; Foreign Honorary Members, 2. The roll of the Academy now includes 196 Resident Fellows, 98 Associate Fellows, and 72 Foreign Honorary Members.

### JAMES MUNSON BARNARD.

MR. BARNARD was born in Boston on the 15th of May, 1819, and died at his home in Milton on the 10th of September, 1904, in the eighty-fourth year of his age. His father was Mr. Charles Barnard, a highly respected commission merchant in the South American trade, in partnership with Mr. Israel Munson. Mr. Barnard was the youngest of his three sons.

As a boy he received his education at the Boston Latin School, but by the time that he had completed his studies there, he had already come under the shadow which was to cloud a great part of his life. He had formed the opinion, which was not without foundation, that he was liable to attacks of hereditary insanity, and this had inspired him with a profound sympathy for the unhappy company among whom he might some day find himself, and with an eager desire to alleviate their burden. Instead, then, of going to college, this boy, not yet out of his teens, determined to go at once to Europe, to study the institutions for the insane, so as to be able to compare them, and the methods adopted in them,

with what was doing in this country. In these studies and in travel he spent four or five years, visiting England and the Continent, and finally making a somewhat extended cruise in the Levant, in a boat of his own, flying the Greek and American flags. He thus saw Greece and some parts of Asia Minor and Syria, besides many of the Greek islands.

On his return home he found that his oldest brother, the Rev. Charles Francis Barnard, was engaged in the establishment of the Warren Street Chapel for Boys, as part of the work of the Ministry for the Poor which had been set on foot by Dr. Tuckerman, and was under the care of the Benevolent Fraternity of the Unitarian churches. In the organization and conduct of this well-devised and wisely directed charity Mr. James Barnard at once took an active part, not only doing his share of the work in the Sunday-school, but evening after evening through the week taking charge of a large class of boys, acquainting himself with their personal needs and ambitions, and encouraging them to better their lives. This was when he was between twenty and thirty years of age, — a time of life when personal ambitions and social claims might well have engrossed his time and attention. As long as he lived he was constantly in the receipt of letters coming from men in every part of the country, written in grateful acknowledgment of these fraternal relations. One of them has since his death placed in the Warren Street Chapel a memorial window, believing that he owed everything that had made life most valuable to him to these wise and seasonable counsels.

This work was the beginning of the career of active beneficence and unselfish devotion which Mr. Barnard made his chief occupation, and which was to continue in many and various fields of usefulness for sixty years. He had no liking for business affairs, and cared more about wisely spending the means at his command than about increasing them. What concerned him most was to increase his own knowledge and understanding, and then to give his time and attention to such kinds of work as need to be done, but can be done only by men who have at command both means and leisure, and are minded to devote to it their time and their money.

In pursuance of the first of these ends he presently joined the company of young men who, when Mr. Agassiz came to Cambridge, hastened to place themselves at his feet and to gain inspiration from his example. At a later period he was formally entered as a student in the Lawrence Scientific School, and his name appears in the annual catalogues from 1854, when he was already thirty-five years old, until 1858. He did not graduate, his studies having been somewhat eclectic; but on his

finally taking up his connections the corporation bestowed upon him the honorary degree of Master of Arts. These years not only greatly extended the range of his intellectual interests and gave him opportunities which he eagerly embraced of seasonably furthering scientific objects which were in need of a helping hand, but brought into his life relations of personal friendship and good-will, both with his teachers and with his fellow-students, which added greatly to its happiness.

But after all, it was the world of men rather than the world of things that he cared for most, and the establishment of the Social Science Association in 1862 aroused in Mr. Barnard warmer sympathies and a still greater measure of activity. He became one of its most convinced promoters, and for some time, during a vacancy in the secretaryship, maintained the office of the Association in Boston, and made it the headquarters of the department committees upon public health and some special branches of education. The Association, after his death, put on record their appreciation "of his devotion to its social and economical interests, and to the extension of its work in education and art, and of the importance of the results of his zeal."

It was probably this work for the Social Science Association which disposed him first to take an active part in the establishment of the Museum of Fine Arts in 1876, and then to further the policy of furnishing the public schools with casts and photographs of statues and paintings. This idea, which is now generally entertained, and which school committees and public libraries rival the publishers in promoting, Mr. Barnard had already advocated both by precept and by example. As early as 1873 he had obtained in London and placed in the hall of the Girls' High School a complete set of the casts of the Frieze of the Parthenon.

In recognition of these public services Mr. Barnard was in 1869 made a member of this Academy, in Class II, Section 3, on the nomination of Professor Benjamin Peirce, Dr. Jeffries Wyman, Dr. B. A. Gould, and Mr. Alexander Agassiz. This was done, as Mr. Peirce wrote to him in informing him of his election, because of "his patriotic devotion to the best interests of the country, because he had been the strength of the Social Science organization, and because, when anything had to be done for science or literature, he was, from the great respect in which he was held, and the weight of his influence, the first man whose support was sought."

Meanwhile he did not for a moment forget, and he did not neglect, the object of his earliest interest. This he now promoted chiefly by

procuring the writing and the publication, at his own expense, of papers upon mental disease, and especially the means of its prevention. These he distributed in large numbers wherever he found that they would be of service. In all this he was assisted by the sympathy and advice of physicians in charge of hospitals for the insane, both public and private. Among these papers the most noticeable, perhaps, are a little book upon "Sanity of Mind," written for him by Dr. David F. Lincoln, and a brief sketch, by Mr. Francis Tiffany, of the "Life of Dr. Philippe Pinel." This was accompanied by a large photograph of the celebrated painting by Tony Robert-Fleury, representing Dr. Pinel striking the fetters from the inmates of the Salpêtrière, which hangs on the walls of that hospital.

At the same time he came to take an increasing interest in the subject of jurisprudence, and especially in international law, and in the promotion of universal peace. This may have sprung from an inherited predisposition, for his father's father, Mr. Samuel Barnard of Deerfield, was, a century ago, one of the eminent legal practitioners of western Massachusetts, known up and down the Connecticut River by the affectionate and by no means disrespectful name of "Lawyer Sam." Here also he had papers of value translated and distributed, especially from the writings of Grotius, and besides these more important undertakings he was constantly in the habit of reprinting and distributing anything that he had found specially interesting or that he thought would be serviceable to others.

The modest scale of living which he had adopted, and which was entirely in accordance with the simplicity of his personal tastes, made it possible for him thus to spend money with considerable freedom. Besides making frequent gifts of books on these subjects to public libraries, both here and abroad, he accumulated several hundred particularly well-chosen volumes upon jurisprudence for his own reading. These, by his will, he bequeathed to the Harvard Law School, together with a sum of money for the increase of their number. This also brought him into personal relations, both abroad and in this country, which, in the somewhat secluded life which he habitually led, were a constant source of satisfaction. These relations were extended and confirmed, from time to time, by brief visits to England and to the Continent. He thus made the acquaintance, among others, of Sir Henry Sumner Maine, of Dr. von Holsendorff in Berlin, and of Mr. John Stuart Mill, with whom he maintained for a number of years a frequent correspondence, and who wrote of him that "he knew of no American

of more enlightened opinions or more desirous of using his opportunities of diffusing them."

These activities were interrupted by many years of ill health, but their burden was lightened by the care and sympathy which a perfectly happy marriage had brought; and when, during the last half dozen years of his life, his strength returned, and there was a renewal of energy, his diligence in furthering what had now become his chief interest seemed to increase quite to the end. Happily the anxieties which had so long haunted him, suddenly, after a long period of depression, finally passed away. The clouds that had darkened his sky seemed to vanish. He became in his old age light-hearted and almost gay, more animated and conversable than he had ever been, and even more active than ever in the furthering of all good enterprises, both his own and other people's. His last years seemed plainly the happiest and most serene of them all.

It is sufficiently apparent, even from this record, that here was a man who strove sedulously and successfully to make the most and the best of himself and of his opportunities, and to do the best and most that was in his power, not only for his immediate friends, but for mankind. It is well that the example of so good a man and so good a citizen should not go unrecorded.

#### JOHN BARTLETT.

JOHN BARTLETT was elected a Fellow of the Academy in 1892, when he was seventy-two years of age. His election was the well-deserved recognition by this body of a remarkable career, probably unique in our annals and likely to remain unique. It was the career of one who was not a trained scholar in any of the sections among which our membership is divided, nor a practitioner in any of the learned professions, but a man who in the course of an active and successful mercantile life of fifty-two years found time to devote to literature in every one of them, who was a collector of books with which he enriched a great library, and who produced literary studies that should make scholars and laymen of every English-speaking country grateful when they hear his name.

He was born in Plymouth, June 14, 1820, and came of ancestors of the oldest New England stock on both sides of the house. He was eighth in descent from that Robert Bartlett who, arriving at Plymouth in 1623, married Mary (the daughter of Richard Warren, Mayflower, 1620), whose eldest son, Benjamin, married a granddaughter of Elder



Brewster, and whose grandson Samuel married a granddaughter of John Alden. His maternal ancestor was Antony Thacher, who arrived in Ipswich in 1636, and after whom is named the island off Cape Ann. Fifth in descent from him was James Thacher, Mr. Bartlett's grandfather, "Surgeon in the Revolutionary War, and its historian; he also wrote the History of Plymouth, American Medical Biography, and several professional books. In his treatise on Hydrophobia he anticipated Pasteur by eighty years or more." \*

What formal education Mr. Bartlett had, he obtained in the public schools of Plymouth, but he was in the main his own teacher through his reading and his reflections upon his reading. The former was carried on from childhood until past his eightieth year, and the latter ceased only with his death. "My mother told me [he writes] that at the age of three I read to her a verse from the Bible; at the age of nine I had read that book from Alpha to Omega. . . . Before the age of twelve I had read most of the juvenile literature of that period, as well as *Pilgrim's Progress*, *Josephus*, *Arabian Nights*, *Opie on Lying*, *Coelebs in Search of a Wife*, *Scottish Chiefs*, *Thaddeus of Warsaw*, *Cruise of the Midge*, *Tom Cringle's Log*, *Paul and Virginia*, *Telemachus*; *Cooper's Spy*, *Pilot*, *Pioneers*, *Last of the Mohicans*, and *Red Rover*; *Scott's Ivanhoe*, *Talisman*, and *Pirate*; *Gulliver's Travels*, and *Munchausen*."

This list seems worth noting and preserving in this memoir because it shows us the books to which an intelligent American boy was attracted in the years 1820-1832. "Opie on Lying" is probably now the least known of them, but I am told that in its day it made even the "white lie" a perfect terror to children.

In 1836, at the age of sixteen, Mr. Bartlett's business life began. He came to Cambridge and entered the employment of John Owen, who kept the University Bookstore and also did not a little publishing for prominent New England writers of the day. At first engaged in the book-binding department, he passed to a clerkship in the store, and was so successful that thirteen years later, in 1849, he became the owner of the establishment. In those days the University Bookstore was connected with the University itself; the payments of the bills of students for books were guaranteed by the Corporation, and the relations between the proprietor of the bookstore and the authorities were close. At the back

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\* These details about Mr. Bartlett's family and some other quotations which will follow are taken from a MS. book which he gave to Harvard College Library in 1900.



of the shop was a little room in which Mr. Bartlett took much pride, and he has often been heard to speak with regret of its disappearance after he had ceased his connection with the business. In this place were laid out copies of new books and of foreign periodicals and journals, and the professors in the college were in the habit of frequenting it as a sort of reading room. To this custom Mr. Bartlett no doubt owed much of his close friendship with many of the remarkable men of the time. He was fit to be their associate, being already well acquainted with the best literature and, as a bookseller, a *rara avis*, for he had actually read the books which he offered for sale, and could speak with authority on their contents. In 1859, however, he disposed of the store to Sever, Allyn, & Francis, and for the next four years was not engaged in business. During the Civil War he served from November, 1862, to July, 1863, as volunteer paymaster in the South Atlantic Squadron. After this he associated himself with the firm of Little, Brown, & Co. in Boston, becoming a partner in that house in February, 1865. Here his chief work consisted in personally dealing with the authors for whom the firm published, but he was also generally recognized as an expert in all matters connected with the actual manufacture of books. He retired on February 1, 1889, in order to be able to devote his time to finishing his *Concordance to Shakespeare*.

In these many years of a business career there were three directions in which Mr. Bartlett was particularly active outside of business hours,—in reading, in compiling literary manuals, and in collecting books in two special fields.

He was an omnivorous reader, and remembered and digested what he read. In 1900 he deposited in the University Library a thick pamphlet entitled by him "A Record of Idle Hours." Herein he wrote thus: "In 1837 I was entered as clerk in a bookstore, and found myself in wandering mazes lost. Without a guide, philosopher, or friend I plunged in, driving through the sea of books like a vessel without pilot or master. My clerical duties were unusually onerous, yet I always found time for study and reading; and during my active business life of fifty-two years I devoted much time to these purposes. My library was dukedom large enough, with few exceptions, for all my wants. The following is a list of the books which I have read." Then follow about seventeen hundred titles,\* in every department of literature, "from grave to gay,

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\* In this enumeration, Shakespeare's Works, Scott's Novels, Byron's Poems, and similar titles are counted only as units.

from lively to severe." It extends into the year 1901, when it ceased only on account of his failing eyesight. It is an extraordinary list, including really all that is good (and much that is not) in English literature, prose and poetry, together with translations of works written in foreign tongues. He did not confine himself to one reading of a book that pleased him. For example, he read Lecky's "European Morals" and Darwin's "Descent of Man" three times, the elder D'Israeli's works and the "Annals" and "Agricola" of Tacitus twice, while for Gibbon we find the extraordinary record of four readings. Many of the standard poets and novelists he read over and over again. Nor did he confine himself to the older books. He kept up with the times. Among the titles of the last years of his record we find the first four volumes of Rhodes's "History of the United States," Lord Rosebery's "Napoleon," and, as the next to the last entry in the pamphlet, the "Creevey Papers."

This extraordinary course of reading and the equally extraordinary memory, which he retained unimpaired almost to the very last, were what fitted him to compile "Familiar Quotations," a work too well known to all lovers of literature to need further characterization here. The first edition, a small thin octavo of 295 pages, published in Cambridge in 1855, grew to the tall thick volume of the ninth and last edition of 1891, comprising 1158 pages, with one of the most useful indexes that ever was composed. It includes also nearly five thousand footnotes, consisting of cross references to the earlier sources of the thought expressed in the quotation concerned, to parallel passages, or to obvious imitations. This part of the book was a real work of literary research, and in 1871 Harvard University appreciatively conferred the honorary degree of A.M. upon the author. Of the sale of "Familiar Quotations" the present publishers can give no exact figures, but report that there is no doubt that it has reached nearly a quarter of a million copies in its various editions. A less widely known work was the "Shakespeare Phrase Book," 1881, (pp. 1034), "a concordance of phrases rather than of mere words, taking every sentence which contains an important thought." This is of course superseded for scholars by the later "New and Complete Concordance or Verbal Index to Words, Phrases and Passages in the Dramatic Works of Shakespeare, with a supplementing concordance to his poems," a large quarto of 1910 pages, published by Macmillan & Co. in London, 1894. Upon this great work he and his wife labored lovingly together at intervals during twenty years. She was herself of literary race, being the daughter of Sidney Willard, professor of Hebrew, and granddaughter of President Joseph Willard,

both of Harvard University and both Fellows of this Academy. A true helpmate, her sympathies were wholly with him in all his undertakings, and their ideal union seemed only accentuated by the devotion with which he gave himself up to the care of her when, in her last years, her mind was clouded and she knew not what she said or did.

In the course of his business Mr. Bartlett had good opportunities to acquire books for himself, and he employed them well. His own library was in general large and excellent, but in two subjects it was that of a specialist. For many years he was a devoted angler, especially for trout and black bass. Lowell's poem addressed "To Mr. John Bartlett, who had sent me a seven-pound trout" is well known. Naturally, therefore, he began to collect books on his favorite sport, and in 1882 published a catalogue\* of his collections. In 1892 he presented this collection, numbering 1014 volumes and 269 pamphlets, to the Harvard College Library, which in turn put forth a complete account of it in the series of *Bibliographical Contributions*.† His other and smaller collection, also presented to the College, was of Proverbs and Emblems, 140 volumes under the former head, 130 under the latter.

Such were the occupations of this busy man; but he was also a lover of social life and blest with close friendships. His sense of humor and his never-failing cheerfulness made him a delightful companion, and even in his extreme old age, although he abounded in anecdotes of the past, he never lost his interest in the affairs of the day. In his prime he was a member of the Somerset, Union, Temple, and St. Botolph clubs; he also belonged to the Colonial Society of Massachusetts, to the Boston Society of Sons of the Revolution, and was in 1894 elected an honorary member of the Harvard Chapter of Phi Beta Kappa. For many years the famous whist club, composed of himself, James Russell Lowell, John Holmes, and Charles F. Choate, met at his house, and when it was dissolved by the death of two of its members and the removal of a third, some of his younger neighbors formed what they called the "Bartlett Club" to enliven his evenings by coming together there once a week. Thus loving friends surrounded him as he "declined into the vale of

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\* Catalogue of Books on Angling, including Ichthyology, Pisciculture, Fisheries, and Fishing Laws. From the Library of a practitioner of more than fifty years' experience in the Art of Angling. Cambridge, 1882, 4°, pp. 77. Supplement, Cambridge, 1886, pp. 26.

† No. 51. The Bartlett Collection. A list of books on Angling, Fishes and Fish Culture, in Harvard College Library, by L. R. Albee. Cambridge, 1896.

years," and the almost blindness of his last lustrum was spared that utter loneliness which is too often the lot of those who have outlived all their contemporaries. He died after a short illness on December 3, 1905, having passed eighty-five years in usefulness and honor.

M. H. MORGAN.

# American Academy of Arts and Sciences

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*Terms expire 1908.*

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JAMES C. WHITE,  
*Terms expire 1909.*

WILLIAM R. WARE.

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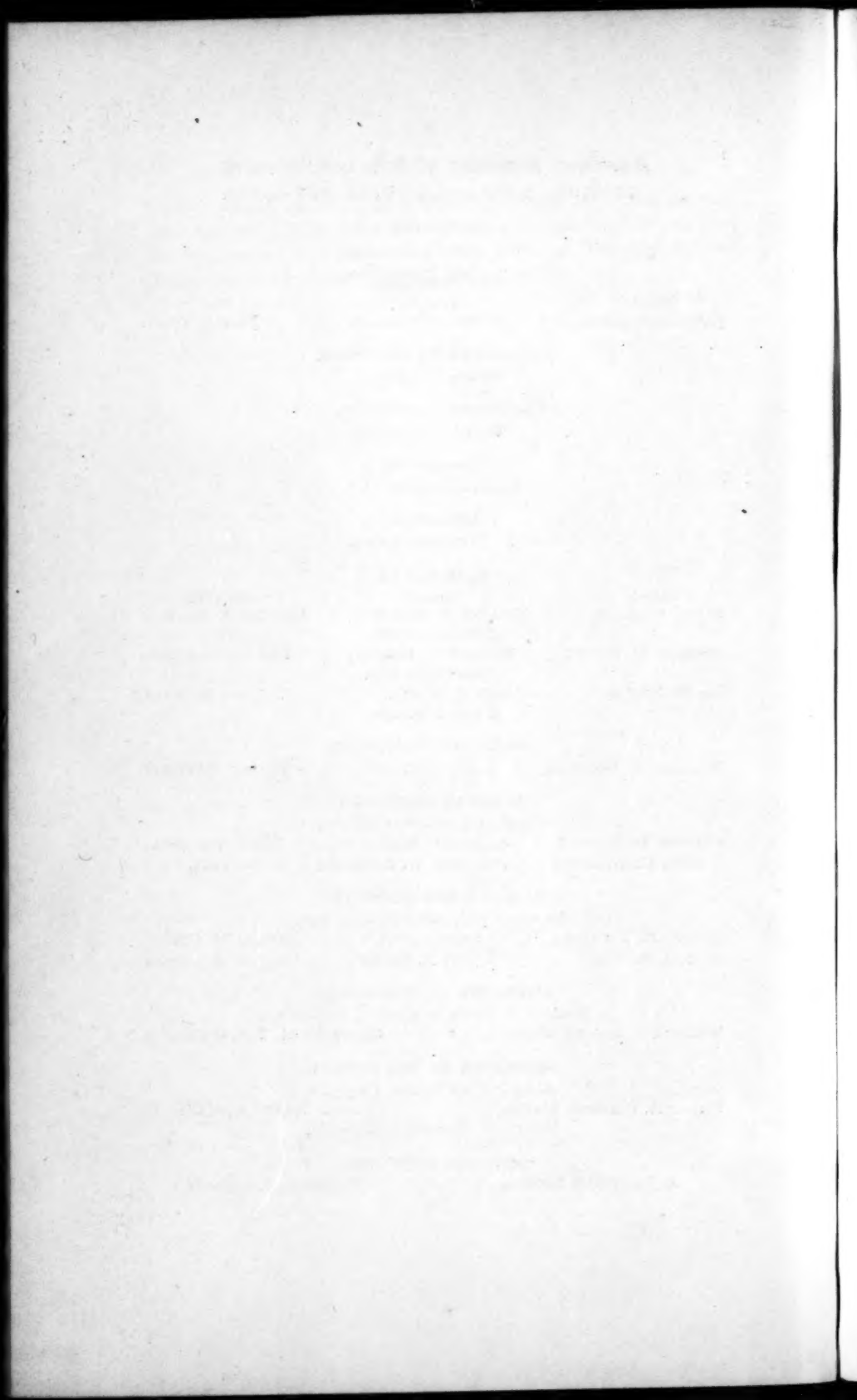
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A. LAWRENCE LOWELL,

FREDERICK J. STIMSON.





# LIST

OF THE

## FELLOWS AND FOREIGN HONORARY MEMBERS.

(Corrected to June 1, 1906.)

### RESIDENT FELLOWS.—196.

(Number limited to two hundred.)

#### CLASS I.—*Mathematical and Physical Sciences.*—78.

##### SECTION I.—17.

###### *Mathematics and Astronomy.*

Solon I. Bailey,	Cambridge.	Harry E. Clifford,	Newton.
Maxime Bôcher,	Cambridge.	Charles R. Cross,	Brookline.
William E. Byerly,	Cambridge.	A. W. Duff,	Worcester.
Seth C. Chandler,	Wellesley Hills.	H. M. Goodwin,	Roxbury.
Gustavus Hay,	Boston.	Edwin H. Hall,	Cambridge.
Percival Lowell,	Boston.	Hammond V. Hayes,	Cambridge.
Edward C. Pickering,	Cambridge.	William L. Hooper,	Somerville.
William H. Pickering,	Cambridge.	William W. Jacques,	Newton.
Henry S. Pritchett,	Boston.	Frank A. Laws,	Boston.
John Ritchie, Jr.,	Roxbury.	Henry Lefavour,	Boston.
Edwin F. Sawyer,	Brighton.	Theodore Lyman,	Brookline.
Arthur Searle,	Cambridge.	Benjamin O. Peirce,	Cambridge.
William E. Story,	Worcester.	A. Lawrence Rotch,	Boston.
Henry Taber,	Worcester.	Wallace C. Sabine,	Boston.
Harry W. Tyler,	Boston.	John S. Stone,	Boston.
O. C. Wendell,	Cambridge.	Elihu Thomson,	Swampscott.
P. S. Yendell,	Dorchester.	John Trowbridge,	Cambridge.
		A. G. Webster,	Worcester.
		Robert W. Willson,	Cambridge.

##### SECTION III.—19.

###### *Chemistry.*

<i>Physics.</i>		Samuel Cabot,	Boston.
A. Graham Bell,	Washington, D.C.	Arthur M. Comey,	Cambridge.
Louis Bell,	Boston.	James M. Crafts,	Boston.
Clarence J. Blake,	Boston.	Charles W. Eliot,	Cambridge.
Francis Blake,	Weston.	Charles L. Jackson,	Cambridge.
George A. Campbell,	Boston.	Walter L. Jennings,	Worcester.

Leonard P. Kinnicutt,	Worcester.	Alfred E. Burton,	Boston.
Charles F. Mabery,	Cleveland, O.	Eliot C. Clarke,	Boston.
Arthur Michael,	Boston.	Heinrich O. Hofman,	Jamaica Plain.
George D. Moore,	Worcester.	Ira N. Hollis,	Cambridge.
John U. Nef,	Chicago, Ill.	L. J. Johnson,	Cambridge.
Arthur A. Noyes,	Boston.	Arthur E. Kennelly,	Cambridge.
Robert H. Richards,	Jamaica Plain.	Gaetano Lanza,	Boston.
Theodore W. Richards,	Cambridge.	E. D. Leavitt,	Cambridge.
Charles R. Sanger,	Cambridge.	William R. Livermore,	New York.
Stephen P. Sharples,	Cambridge.	Hiram F. Mills,	Lowell.
Francis H. Storer,	Boston.	Cecil H. Peabody,	Brookline.
Henry P. Talbot,	Newton.	Andrew H. Russell,	Manila.
Charles H. Wing,	Ledger, N. C.	Albert Sauveur,	Cambridge.
		Peter Schwamb,	Arlington.
		H. L. Smyth,	Cambridge.
		George F. Swain,	Boston.
		William Watson,	Boston.

## SECTION IV. — 18.

*Technology and Engineering.*

Comfort A. Adams, Cambridge.

CLASS II. — *Natural and Physiological Sciences.* — 64.

## SECTION I. — 14.

*Geology, Mineralogy, and Physics of the Globe.*

H. H. Clayton,	Milton.
Algernon Coolidge,	Boston.
William O. Crosby,	Jamaica Plain.
William M. Davis,	Cambridge.
Benj. K. Emerson,	Amherst.
O. W. Huntington,	Newport, R. I.
Robert T. Jackson,	Cambridge.
T. A. Jaggar, Jr.,	Cambridge.
William H. Niles,	Cambridge.
Charles Palache,	Cambridge.
John E. Pillsbury,	Boston.
Robert DeC. Ward,	Cambridge.
John E. Wolff,	Cambridge.
J. B. Woodworth,	Cambridge.

## SECTION II. — 12.

*Botany.*

F. S. Collins,	Malden.
Geo. E. Davenport,	Medford.
William G. Farlow,	Cambridge.
Charles E. Faxon,	Jamaica Plain.
Merritt L. Fernald,	Cambridge.
George L. Goodale,	Cambridge.
John G. Jack,	Jamaica Plain.
Edward C. Jeffrey,	Cambridge.
B. L. Robinson,	Cambridge.
Charles S. Sargent,	Brookline.
Arthur B. Seymour,	Cambridge.
Roland Thaxter,	Cambridge.

## SECTION III. — 24.

*Zoölogy and Physiology.*

Alexander Agassiz,	Cambridge.
Robert Amory,	Boston.

Henry P. Bowditch, Jamaica Plain.  
 William Brewster, Cambridge.  
 Louis Cabot, Brookline.  
 Walter B. Cannon, Cambridge.  
 William E. Castle, Cambridge.  
 Samuel F. Clarke, Williamstown.  
 W. T. Councilman, Boston.  
 Harold C. Ernst, Jamaica Plain.  
 Edward G. Gardiner, Boston.  
 Samuel Henshaw, Cambridge.  
 Theodore Hough, Boston.  
 John S. Kingsley, Somerville.  
 Edward L. Mark, Cambridge.  
 Charles S. Minot, Milton.  
 Edward S. Morse, Salem.  
 George H. Parker, Cambridge.  
 William T. Porter, Boston.  
 James J. Putnam, Boston.  
 Samuel H. Scudder, Cambridge.  
 William T. Sedgwick, Boston.

James C. White, Boston.  
 William M. Woodworth, Cambridge.

## SECTION IV. — 14.

*Medicine and Surgery.*

Edward H. Bradford, Boston.  
 Arthur T. Cabot, Boston.  
 David W. Cheever, Boston.  
 Thomas Dwight, Nahant.  
 Reginald H. Fitz, Boston.  
 Charles F. Folsom, Boston.  
 Frederick I. Knight, Boston.  
 Samuel J. Mixter, Boston.  
 W. L. Richardson, Boston.  
 Theobald Smith, Jamaica Plain.  
 O. F. Wadsworth, Boston.  
 Henry P. Walcott, Cambridge.  
 John C. Warren, Boston.  
 Francis H. Williams, Boston.

CLASS III. — *Moral and Political Sciences.* — 54.

## SECTION I. — 10.

*Philosophy and Jurisprudence.*

James B. Ames, Cambridge.  
 Joseph H. Beal, Jr., Cambridge.  
 John C. Gray, Boston.  
 Francis C. Lowell, Boston.  
 Hugo Münsterberg, Cambridge.  
 Josiah Royce, Cambridge.  
 Jeremiah Smith, Cambridge.  
 Frederic J. Stimson, Dedham.  
 Edward H. Strobel, Cambridge.  
 Samuel Williston, Belmont.

## SECTION II. — 23.

*Philology and Archæology.*

Charles P. Bowditch, Jamaica Plain.  
 Lucien Carr, Cambridge.

Franklin Carter, Williamstown.  
 Joseph T. Clarke, Harrow, Eng.  
 Henry G. Denny, Roxbury.  
 J. W. Fewkes, Washington.  
 William W. Goodwin, Cambridge.  
 Henry W. Haynes, Boston.  
 Albert A. Howard, Cambridge.  
 Charles R. Lanman, Cambridge.  
 David G. Lyon, Cambridge.  
 George F. Moore, Cambridge.  
 Morris H. Morgan, Cambridge.  
 Bennett H. Nash, Boston.  
 Frederick W. Putnam, Cambridge.  
 Edward Robinson, Boston.  
 Edward S. Sheldon, Cambridge.  
 Herbert Weir Smyth, Cambridge.  
 F. B. Stephenson, Boston.  
 Crawford H. Toy, Cambridge.  
 John W. White, Cambridge.  
 John H. Wright, Cambridge.  
 Edward J. Young, Waltham.

## SECTION III.—11.

*Political Economy and History.*

Charles F. Adams,	Lincoln.
Thomas N. Carver,	Cambridge.
Andrew McF. Davis,	Cambridge.
Ephraim Emerton,	Cambridge.
A. C. Goodell,	Salem.
Charles Gross,	Cambridge.
Henry C. Lodge,	Nahant.
A. Lawrence Lowell,	Boston.
James F. Rhodes,	Boston.
Charles C. Smith,	Boston.
F. W. Taussig,	Cambridge.

## SECTION IV.—10.

*Literature and the Fine Arts.*

Francis Bartlett,	Boston.
Arlo Bates,	Boston.
Kuno Francke,	Cambridge.
T. W. Higginson,	Cambridge.
George L. Kittredge,	Cambridge.
Charles Eliot Norton,	Cambridge.
Denman W. Ross,	Cambridge.
William R. Ware,	Milton.
Herbert L. Warren,	Cambridge.
Barrett Wendell,	Boston.

## ASSOCIATE FELLOWS. — 98.

(Number limited to one hundred. Elected as vacancies occur.)

CLASS I. — *Mathematical and Physical Sciences.* — 37.

## SECTION I. — 14.

*Mathematics and Astronomy.*

Edward E. Barnard,	Williams Bay, Wis.
S. W. Burnham,	Williams Bay, Wis.
George Davidson,	San Francisco.
Fabian Franklin,	Baltimore.
Asaph Hall,	S. Norfolk, Conn.
George W. Hill,	W. Nyack, N. Y.
E. S. Holden,	New York.
Emory McClintock,	Morristown, N. J.
E. H. Moore,	Chicago.
Simon Newcomb,	Washington.
Charles L. Poor,	New York.
George M. Searle,	Washington.
J. N. Stockwell,	Cleveland, O.
Chas. A. Young,	Hanover, N. H.

## SECTION II. — 6.

*Physics.*

Carl Barus,	Providence, R. I.
G. E. Hale,	Williams Bay, Wis.
T. C. Mendenhall,	Worcester.
A. A. Michelson,	Chicago.

E. L. Nichols,	Ithaca, N. Y.
M. I. Pupin,	New York.

## SECTION III. — 9.

*Chemistry.*

Wolcott Gibbs,	Newport, R. I.
Frank A. Gooch,	New Haven.
Eugene W. Hilgard,	Berkeley, Cal.
S. W. Johnson,	New Haven.
J. W. Mallet,	Charlottesville, Va.
E. W. Morley,	Cleveland, O.
Charles E. Munroe,	Washington.
J. M. Ordway,	New Orleans.
Ira Remsen,	Baltimore.

## SECTION IV. — 8.

*Technology and Engineering.*

Henry L. Abbot,	Cambridge.
Cyrus B. Comstock,	New York. [Va.
W. P. Craighill,	Charlestown, W.
John Fritz,	Bethlehem, Pa.
James D. Hague,	New York.
F. R. Hutton,	New York.
William Sellers,	Edge Moor, Del.
Robt. S. Woodward,	New York.

CLASS II. — *Natural and Physiological Sciences.* — 33.

## SECTION I. — 11.

*Geology, Mineralogy, and Physics of  
the Globe.*

Cleveland Abbe,	Washington.
George J. Brush,	New Haven.
T. C. Chamberlin,	Chicago.
Edward S. Dana,	New Haven.
Walter G. Davis,	Cordova, Arg.
Samuel F. Emmons,	Washington.
G. K. Gilbert,	Washington.
S. L. Penfield,	New Haven.
R. Pumpelly,	Newport, R. I.
Israel C. Russell,	Ann Arbor.
Charles D. Walcott,	Washington.

## SECTION II.—6.

*Botany.*

L. H. Bailey,	Ithaca, N. Y.
D. H. Campbell,	Palo Alto, Cal.
J. M. Coulter,	Chicago.
C. G. Pringle,	Charlotte, Vt.
John D. Smith,	Baltimore.
W. Trelease,	St. Louis.

## SECTION III.—9.

*Zoölogy and Physiology.*

Joel A. Allen,	New York.
W. K. Brooks,	Lake Roland, Md.
C. B. Davenport,	Cold Spring Harbor, N. Y.
F. P. Mall,	Baltimore.

S. Weir Mitchell,	Philadelphia.
H. F. Osborn,	New York.
A. E. Verrill,	New Haven.
C. O. Whitman,	Chicago.
E. B. Wilson,	New York.

## SECTION IV.—8.

*Medicine and Surgery.*

John S. Billings,	New York.
W. S. Halsted,	Baltimore.
Abraham Jacobi,	New York.
W. W. Keen,	Philadelphia.
William Osler,	Oxford, Eng.
T. Mitchell Prudden,	New York.
Wm. H. Welch,	Baltimore.
H. C. Wood,	Philadelphia.

CLASS III.—*Moral and Political Sciences.*—27.

## SECTION I.—6.

*Philosophy and Jurisprudence.*

Joseph H. Choate,	New York.
Melville W. Fuller,	Washington.
William W. Howe,	New Orleans.
Charles S. Peirce,	Milford, Pa.
G. W. Pepper,	Philadelphia.
T. R. Pynchon,	Hartford, Conn.

## SECTION II.—7.

*Philology and Archæology.*

Timothy Dwight,	New Haven.
B. L. Gildersleeve,	Baltimore.
D. C. Gilman,	Baltimore.
T. R. Lounsbury,	New Haven.
Rufus B. Richardson,	New York.
Thomas D. Seymour,	New Haven.
A. D. White,	Ithaca, N. Y.

## SECTION III.—7.

*Political Economy and History.*

Henry Adams,	Washington.
G. P. Fisher,	New Haven.
Arthur T. Hadley,	New Haven.
Henry C. Lea,	Philadelphia.
Alfred T. Mahan,	New York.
H. Morse Stephens,	Ithaca.
W. G. Sumner,	New Haven.

## SECTION IV.—7.

*Literature and the Fine Arts.*

James B. Angell,	Ann Arbor, Mich.
H. H. Furness,	Wallingford, Pa.
R. S. Greenough,	Florence.
Herbert Putnam,	Washington.
Augustus St. Gaudens,	Windsor, Vt.
John S. Sargent,	London.
E. C. Stedman,	Bronxville, N. Y.



## FOREIGN HONORARY MEMBERS.—72.

(Number limited to seventy-five. Elected as vacancies occur.)

CLASS I.—*Mathematical and Physical Sciences.*—25.

## SECTION I.—7.

*Mathematics and Astronomy.*

Arthur Auwers,	Berlin.
George H. Darwin,	Cambridge.
Sir William Huggins,	London.
Felix Klein,	Göttingen.
Émile Picard,	Paris.
H. Poincaré,	Paris.
H. C. Vogel,	Potsdam.

## SECTION II.—6.

*Physics.*

Ludwig Boltzmann,	Vienna.
Oliver Heaviside,	Newton Abbot.
F. Kohlrausch,	Marburg.
Joseph Larmor,	Cambridge.
Lord Rayleigh,	Witham.
Joseph J. Thomson,	Cambridge.

## SECTION III.—7.

*Chemistry.*

Adolf Ritter von Baeyer,	Munich.
Marcellin Berthelot,	Paris.
J. H. van't Hoff,	Berlin.
D. Mendeleeff,	St. Petersburg.
Wilhelm Ostwald,	Leipsic.
Sir H. E. Roscoe,	London.
Julius Thomsen,	Copenhagen.

## SECTION IV.—5.

*Technology and Engineering.*

Sir Benjamin Baker,	London.
Lord Kelvin,	Largs.
Maurice Lévy,	Paris.
H. Müller-Breslau,	Berlin.
W. Cawthorne Unwin,	London.

CLASS II.—*Natural and Physiological Sciences.*—23.

## SECTION I.—5.

*Geology, Mineralogy, and Physics of the Globe.*

Sir Archibald Geikie,	London.
Julius Hann,	Vienna.
Albert Heim,	Zurich.
Sir John Murray,	Edinburgh.
Henry C. Sorby,	Sheffield.

## SECTION II.—6.

*Botany.*

E. Bornet,	Paris.
A. Engler,	Berlin.
Sir Joseph D. Hooker,	Sunningdale.
W. Pfeffer,	Leipsic.
H. Graf zu Solms-Laubach,	Strassburg.
Eduard Strasburger,	Bonn.

## SECTION III. — 5.

*Zoölogy and Physiology.*

Sir Michael Foster,	Cambridge.
Ludimar Hermann,	Königsberg.
H. Kronecker,	Bern.
E. Ray Lankester,	London.
Elias Metschnikoff,	Paris.

## SECTION IV. — 7.

*Medicine and Surgery.*

Emil von Behring,	Marburg.
Sir T. L. Brunton,	London.
A. Celli,	Rome.
Sir V. A. H. Horsley,	London.
R. Koch,	Berlin.
Lord Lister,	London.
F. v. Recklinghausen,	Strassburg.

CLASS III. — *Moral and Political Sciences.* — 24.

## SECTION I. — 5.

*Philosophy and Jurisprudence.*

A. J. Balfour,	Prestonkirk.
Heinrich Brunner,	Berlin.
A. V. Dicey,	Oxford.
F. W. Maitland,	Cambridge.
Sir Frederick Pollock,	
Bart.,	London.

## SECTION III. — 5.

*Political Economy and History.*

James Bryce,	London.
Adolf Harnack,	Berlin.
Sir G. O. Trevelyan,	
Bart.,	London.
John Morley,	London.
Pasquale Villari,	Florence.

## SECTION II. — 7.

*Philology and Archæology.*

Ingram Bywater,	Oxford.
F. Delitzsch,	Berlin.
W. Dörpfeld,	Athens.
Sir John Evans,	Hemel Hempstead.
H. Jackson,	Cambridge.
J. W. A. Kirchhoff,	Berlin.
G. C. C. Maspero,	Paris.

## SECTION IV. — 7.

*Literature and the Fine Arts.*

E. de Amicis,	Florence.
Gaston Boissier,	Paris.
Georg Brandes,	Copenhagen.
F. Brunetière,	Paris.
S. H. Butcher,	London.
Jean Léon Gérôme,	Paris.
Rudyard Kipling,	Burwash.

## STATUTES AND STANDING VOTES.

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### STATUTES.

*Adopted May 30, 1854: amended September 8, 1857, November 12, 1862, May 24, 1864, November 9, 1870, May 27, 1873, January 26, 1876, June 16, 1886, October 8, 1890, January 11, and May 10, 1893, May 9, and October 10, 1894, March 13, April 10, and May 8, 1895, May 8, 1901, January 8, 1902, May 10, 1905, February 14 and March 14, 1906.*

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### CHAPTER I.

#### OF FELLOWS AND FOREIGN HONORARY MEMBERS.

1. The Academy consists of Resident Fellows, Associate Fellows, and Foreign Honorary Members. They are arranged in three Classes, according to the Arts and Sciences in which they are severally proficient, viz.: Class I. The Mathematical and Physical Sciences;—Class II. The Natural and Physiological Sciences;—Class III. The Moral and Political Sciences. Each Class is divided into four Sections, viz.: Class I., Section 1. Mathematics and Astronomy;—Section 2. Physics;—Section 3. Chemistry;—Section 4. Technology and Engineering. Class II., Section 1. Geology, Mineralogy, and Physics of the Globe;—Section 2. Botany; Section 3. Zoölogy and Physiology;—Section 4. Medicine and Surgery. Class III., Section 1. Theology, Philosophy, and Jurisprudence;—Section 2. Philology and Archæology;—Section 3. Political Economy and History;—Section 4. Literature and the Fine Arts.

2. The number of Resident Fellows shall not exceed two hundred, of whom there shall not be more than eighty in any one of the three classes. Only residents in the Commonwealth of Massachusetts shall be eligible to election as Resident Fellows, but resident fellowship may be retained after removal from the Commonwealth. Each Resident Fellow shall

pay an admission fee of ten dollars and such annual assessment, not exceeding ten dollars, as shall be voted by the Academy at each annual meeting. Resident Fellows only may vote at the meetings of the Academy.

3. The number of Associate Fellows shall not exceed one hundred, of whom there shall not be more than forty in either of the three classes of the Academy. Associate Fellows shall be chosen from persons residing outside of the Commonwealth of Massachusetts. They shall not be liable to the payment of any fees or annual dues, but on removing within the Commonwealth they may be transferred by the Council to resident fellowship as vacancies there occur.

4. The number of Foreign Honorary Members shall not exceed seventy-five; and they shall be chosen from among persons most eminent in foreign countries for their discoveries and attainments in either of the three departments of knowledge above enumerated. There shall not be more than thirty Foreign Members in either of these departments.

## CHAPTER II.

### OF OFFICERS.

1. There shall be a President, three Vice-Presidents, one for each Class, a Corresponding Secretary, a Recording Secretary, a Treasurer, and a Librarian, which officers shall be annually elected, by ballot, at the annual meeting, on the second Wednesday in May.

2. There shall be nine Councillors, chosen from the Resident Fellows. At each annual meeting, three Councillors shall be chosen, by ballot, one from each Class, to serve for three years; but the same Fellow shall not be eligible for two successive terms. The nine Councillors, with the President, the three Vice-Presidents, the two Secretaries, the Treasurer, and the Librarian, shall constitute the Council. Five members shall constitute a quorum. It shall be the duty of this Council to exercise a discreet supervision over all nominations and elections. With the consent of the Fellow interested, they shall have power to make transfers between the several sections of the same Class, reporting their action to the Academy.

3. The Council shall at its March Meeting receive reports from the Rumford Committee, the C. M. Warren Committee, the Committee on Publication, the Committee on the Library, the President and Record-

ing Secretary, and the Treasurer, proposing the appropriations for their work during the year beginning the following May. The Treasurer at the same meeting shall report on the income which will probably be received on account of the various Funds during the same year.

At the Annual Meeting, the Council shall submit to the Academy, for its action, a report recommending the appropriations which in the opinion of the Council should be made for the various purposes of the Academy.

4. If any office shall become vacant during the year, the vacancy shall be filled by a new election, at the next stated meeting, or at a meeting called for this purpose.

### CHAPTER III.

#### OF NOMINATIONS OF OFFICERS.

1. At the stated meeting in March, the President shall appoint a Nominating Committee of three Resident Fellows, one for each Class.

2. It shall be the duty of this Nominating Committee to prepare a list of candidates for the offices of President, Vice-Presidents, Corresponding Secretary, Recording Secretary, Treasurer, Librarian, Councillors, and the Standing Committees which are chosen by ballot; and to cause this list to be sent by mail to all the Resident Fellows of the Academy not later than four weeks before the Annual Meeting.

3. Independent nominations for any office, signed by at least five Resident Fellows, and received by the Recording Secretary not less than ten days before the Annual Meeting, shall be inserted in the call for the Annual Meeting, which shall then be issued not later than one week before that meeting.

4. The Recording Secretary shall prepare for use, in voting at the Annual Meeting, a ballot containing the names of all persons nominated for office under the conditions given above.

5. When an office is to be filled at any other time than at the Annual Meeting, the President shall appoint a Nominating Committee in accordance with the provisions of Section 1, which shall announce its nomination in the manner prescribed in Section 2 at least two weeks before the time of election. Independent nominations, signed by at least five Resident Fellows and received by the Recording Secretary not later than one week before the meeting for election, shall be inserted in the call for that meeting.

## CHAPTER IV.

## OF THE PRESIDENT.

1. It shall be the duty of the President, and, in his absence, of the senior Vice-President present, or next officer in order as above enumerated, to preside at the meetings of the Academy; to direct the Recording Secretary to call special meetings; and to execute or to see to the execution of the Statutes of the Academy. Length of continuous membership in the Academy shall determine the seniority of the Vice-Presidents.

2. The President, or, in his absence, the next officer as above enumerated, shall nominate members to serve on the different committees of the Academy which are not chosen by ballot.

3. Any deed or writing to which the common seal is to be affixed shall be signed and sealed by the President, when thereto authorized by the Academy.

## CHAPTER V.

## OF STANDING COMMITTEES.

1. At the Annual Meeting there shall be chosen the following Standing Committees, to serve for the year ensuing, viz.: —

2. The Committee on Finance to consist of three Fellows to be chosen by ballot, who shall have, through the Treasurer, full control and management of the funds and trusts of the Academy, with the power of investing and of changing the investment of the same at their discretion.

3. The Rumford Committee, to consist of seven Fellows to be chosen by ballot, who shall consider and report to the Academy on all applications and claims for the Rumford premium. They shall also report to the Council in March of each year on all appropriations of the income of the Rumford Fund needed for the coming year, and shall generally see to the due and proper execution of the trust. All bills incurred on account of the Rumford Fund, within the limits of the appropriation made by the Academy, shall be approved by the Chairman of the Rumford Committee.

4. The C. M. Warren Committee, to consist of seven Fellows to be chosen by ballot, who shall consider and report to the Council in March of each year on all applications for appropriations from the income of the C. M. Warren Fund for the coming year, and shall generally see to the due



and proper execution of the trust. All bills incurred on account of the C. M. Warren Fund, within the limits of the appropriations made by the Academy, shall be approved by the Chairman of the C. M. Warren Committee.

5. The Committee on Publication, to consist of three Fellows, one from each class, to whom all communications submitted to the Academy for publication shall be referred, and to whom the printing of the Proceedings and Memoirs shall be entrusted. This Committee shall report to the Council in March of each year on the appropriations needed for the coming year. All bills incurred on account of publications, within the limits of the appropriations made by the Academy, shall be approved by the Chairman of the Committee on Publication.

6. The Committee on the Library, to consist of the Librarian *ex officio*, and three other Fellows, one from each class, who shall examine the Library and make an annual report on its condition and management. This Committee, through the Librarian, shall report to the Council in March of each year, on the appropriations needed for the Library for the coming year. All bills incurred on account of the Library, within the limits of the appropriations made by the Academy, shall be approved by the Librarian.

7. The President and Recording Secretary shall be a Committee on the general expenditures of the Academy. This Committee shall report to the Council in March of each year on the appropriations needed for the general expenditures for the coming year, and either member of the Committee may approve bills incurred on this account within the limits of the appropriations made by the Academy.

8. An auditing Committee, to consist of two Fellows, for auditing the accounts of the Treasurer, with power to employ an expert and to approve his bill.

9. In the absence of the Chairman of any Committee, bills may be approved by a member of the Committee designated by the Chairman for the purpose.

## CHAPTER VI.

### OF THE SECRETARIES.

1. The Corresponding Secretary shall conduct the correspondence of the Academy, recording or making an entry of all letters written in its name, and preserving on file all letters which are received; and at each

meeting he shall present the letters which have been addressed to the Academy since the last meeting. Under the direction of the Council, he shall keep a list of the Resident Fellows, Associate Fellows, and Foreign Honorary Members, arranged in their Classes and in Sections in respect to the special sciences in which they are severally proficient; and he shall act as secretary to the Council.

2. The Recording Secretary shall have charge of the Charter and Statute-book, journals, and all literary papers belonging to the Academy. He shall record the proceedings of the Academy at its meetings; and after each meeting is duly opened, he shall read the record of the preceding meeting. He shall notify the meetings of the Academy, apprise officers and committees of their election or appointment, and inform the Treasurer of appropriations of money voted by the Academy. He shall post up in the Hall a list of the persons nominated for election into the Academy; and when any individual is chosen, he shall insert in the record the names of the Fellows by whom he was nominated.

3. The two Secretaries, with the Chairman of the Committee of Publication, shall have authority to publish such of the records of the meetings of the Academy as may seem to them calculated to promote its interests.

4. Every person taking any books, papers, or documents belonging to the Academy and in the custody of the Recording Secretary, shall give a receipt for the same to the Recording Secretary.

## CHAPTER VII.

### OF THE TREASURER.

1. The Treasurer shall give such security for the trust reposed in him as the Academy shall require.

2. He shall receive all moneys due or payable to the Academy and all bequests and donations made to the Academy. He shall pay all bills due by the Academy, when approved by the proper officers (except those of the Treasurer's office, which may be paid without such approval). He shall sign all leases of real estate in the name of the Academy. All transfers of stocks, bonds, and other securities belonging to the Academy shall be made by the Treasurer with the written consent of one member of the Committee of Finance. He shall keep an account of all receipts and expenditures, shall submit his accounts annually to the Auditing

Committee, and shall report the same at the expiration of his term of office or whenever called on so to do by the Academy or Council.

3. The Treasurer shall keep separate accounts of the income and appropriation of the Rumford Fund and of other special funds, and report the same annually.

4. The Treasurer may appoint an Assistant Treasurer to perform his duties, for whose acts, as such assistant, the Treasurer shall be responsible; or the Treasurer may employ any Trust Company, doing business in Boston, as agent to perform his duties, the compensation of such Assistant Treasurer or agent to be paid from the funds of the Academy.

## CHAPTER VIII.

### OF THE LIBRARIAN AND LIBRARY.

1. It shall be the duty of the Librarian to take charge of the books, to keep a correct catalogue of them, to provide for the delivery of books from the Library, and to appoint such agents for these purposes as he may think necessary. He shall make an annual report on the condition of the Library.

2. The Librarian, in conjunction with the Committee on the Library, shall have authority to expend such sums as may be appropriated, either from the General, Rumford, or other special Funds of the Academy, for the purchase of books, periodicals, etc., and for defraying other necessary expenses connected with the Library.

3. To all books in the Library procured from the income of the Rumford Fund, or other special funds, the Librarian shall cause a stamp or label to be affixed, expressing the fact that they were so procured.

4. Every person who takes a book from the Library shall give a receipt for the same to the Librarian or his assistant.

5. Every book shall be returned in good order, regard being had to the necessary wear of the book with good usage. If any book shall be lost or injured, the person to whom it stands charged shall replace it by a new volume or set, if it belongs to a set, or pay the current price of the volume or set to the Librarian; and thereupon the remainder of the set, if the volume belonged to a set, shall be delivered to the person so paying for the same.

6. All books shall be returned to the Library for examination at least one week before the Annual Meeting.

7. The Librarian shall have custody of the Publications of the Academy. With the advice and consent of the President, he may effect exchanges with other associations.

## CHAPTER IX.

### OF MEETINGS.

1. There shall be annually four stated meetings of the Academy; namely, on the second Wednesday in May (the Annual Meeting), on the second Wednesday in October, on the second Wednesday in January, and on the second Wednesday in March. At these meetings, only, or at meetings adjourned from these and regularly notified, or at special meetings called for the purpose, shall appropriations of money be made, or alterations of the statutes or standing votes of the Academy be effected.

Special meetings shall be called by the Recording Secretary at the request of the President or of a Vice-President or of five Fellows. Notifications of the special meetings shall contain a statement of the purpose for which the meeting is called.

2. Fifteen Resident Fellows shall constitute a quorum for the transaction of business at a stated or special meeting. Seven Fellows shall be sufficient to constitute a meeting for scientific communications and discussions.

3. The Recording Secretary shall notify the meetings of the Academy to each Resident Fellow; and he may cause the meetings to be advertised, whenever he deems such further notice to be needful.

## CHAPTER X.

### OF THE ELECTION OF FELLOWS AND HONORARY MEMBERS.

1. Elections shall be made by ballot, and only at stated meetings.

2. Candidates for election as Resident Fellows must be proposed by two Resident Fellows of the section to which the proposal is made, in a recommendation signed by them; and this recommendation shall be transmitted to the Corresponding Secretary, and by him referred to the Council. No person recommended shall be reported by the Council as a

candidate for election, unless he shall have received the approval of at least five members of the Council present at a meeting. All nominations thus approved shall be read to the Academy at any meeting, and shall then stand on the nomination list until the next stated meeting, and until the balloting. No person shall be elected a Resident Fellow, unless he shall have been resident in this Commonwealth one year next preceding his election. If any person elected a Resident Fellow shall neglect for one year to pay his admission fee, his election shall be void; and if any Resident Fellow shall neglect to pay his annual assessments for two years, provided that his attention shall have been called to this article, he shall be deemed to have abandoned his Fellowship; but it shall be in the power of the Treasurer, with the consent of the Council, to dispense (*sub silentio*) with the payment both of the admission fee and of the assessments, whenever in any special instance he shall think it advisable so to do.

3. The nomination and election of Associate Fellows shall take place in the manner prescribed in reference to Resident Fellows.

4. The nomination and election of Foreign Honorary Members shall take place in the manner prescribed for Resident Fellows, except that the nomination papers shall be signed by at least seven members of the Council before being presented to the Academy.

5. Three-fourths of the ballots cast must be affirmative, and the number of affirmative ballots must amount to eleven to effect an election of Fellows or Foreign Honorary Members.

6. If, in the opinion of a majority of the entire Council, any Fellow—Resident or Associate—shall have rendered himself unworthy of a place in the Academy, the Council shall recommend to the Academy the termination of his Fellowship; and provided that a majority of two-thirds of the Fellows at a stated meeting, consisting of not less than fifty Fellows, shall adopt this recommendation, his name shall be stricken off the roll of Fellows.

## CHAPTER XI.

### OF AMENDMENTS OF THE STATUTES.

1. All proposed alterations of the Statutes, or additions to them, shall be referred to a committee, and, on their report at a subsequent stated meeting or a special meeting called for the purpose, shall require for

enactment a majority of two-thirds of the members present, and at least eighteen affirmative votes.

2. Standing votes may be passed, amended, or rescinded at a stated meeting, or a special meeting called for the purpose by a majority of two-thirds of the members present. They may be suspended by a unanimous vote.

## CHAPTER XII.

### OF LITERARY PERFORMANCES.

1. The Academy will not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its publications.



## STANDING VOTES.

1. Communications of which notice has been given to the Secretary shall take precedence of those not so notified.
2. Associate Fellows, Foreign Honorary Members, and Resident Fellows, who have paid all fees and dues chargeable to them, are entitled to receive one copy of each volume or article printed by the Academy on application to the Librarian personally or by written order within two years of the date of publication. Exceptions to this rule may be made in special cases by vote of the Academy.
3. The Committee of Publication shall fix from time to time the price at which the publications of the Academy may be sold. But members may be supplied at half this price with volumes which they are not entitled to receive free, and which are needed to complete their sets.
4. Two hundred extra copies of each paper accepted for publication in the Memoirs or Proceedings of the Academy shall be placed at the disposal of the author, free of charge.
5. Resident Fellows may borrow and have out from the Library six volumes at any one time, and may retain the same for three months, and no longer.
6. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library for a limited period.
7. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy, except by special leave of the Librarian.
8. Books, publications, or apparatus shall be procured from the income of the Rumford Fund only on the certificate of the Rumford Committee that they, in their opinion, will best facilitate and encourage the making of discoveries and improvements which may merit the Rumford Premium; and the approval of a bill incurred for such purposes by the Chairman shall be accepted by the Treasurer as proof that such certificate has been given.
9. A meeting for receiving and discussing scientific communications may be held on the second Wednesday of each month not appointed for stated meetings, excepting July, August, and September.

## RUMFORD PREMIUM.

In conformity with the terms of the gift of Benjamin, Count Rumford, granting a certain fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his letter of gift, the Academy is empowered to make from the income of said fund, as it now exists, at any Annual Meeting, an award of a gold and a silver medal, being together of the intrinsic value of three hundred dollars, as a premium to the author of any important discovery or useful improvement in light or in heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American islands; preference being always given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind; and to add to such medals, as a further premium for such discovery and improvement, if the Academy see fit so to do, a sum of money not exceeding three hundred dollars.

# INDEX.

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- Abbe, Ernst, Memorial to, 807.  
 Académie royale d'Archeologie de Belgique, Invitation from, 807.  
 Academy of Science, St. Louis, Invitation from, 814.  
 Acoustics, Architectural, The Accuracy of Musical Taste with Respect to, 821.  
 Adams, Comfort Avery, elected Resident Fellow, 819.  
 Agassiz, Alexander, An Account of his Trip to the Eastern Pacific, 810.  
 Alcohol and Ether in the Neighborhood of their Boiling Points, The Expansibility and the Compressibility of, 811.  
 Alcohol, On the Coefficients of Compressibility and Expansion of, 833.  
 Alloys, especially German-Silver, On Thermo-Electric Heterogeneity in Certain, 541-574, 811.  
 American Philosophical Society, Invitation from, 814.  
 Appropriations, 830.  
 Assessment, Annual, Amount of, 830.  
 Atkinson, Edward, Death of, 811.  
 Atmosphere in the Tropics, Results of the Franco-American Expedition to explore the, 818.  
 Atomic Weight of Iodine, Revision of, 71-85.  
 Balloons, Registration, On the First Observations with, in America, 345-350.  
 Barnard, James M., Notice of, 811, 837.  
 Barrows, W. M. See Castle, W. E., Carpenter, F. W., Clark, A. H., and Barrows, W. M.  
 Bartlett, John, Death of, 811; Notice of, 841.  
 Baxter, G. P., A Revision of the Atomic Weight of Iodine. Second Paper, 71-85.  
 Beale, Joseph Henry, Jr., elected Resident Fellow, 819; accepts Fellowship, 822.  
 Bell, Louis, elected Resident Fellow, 808; Some Modern Illuminants and the Mechanical Theory of Light, 822.  
 Bishop, F. L., The Thermal Conductivity of Lead, 669-689, 812. See Laws, F. A., Bishop, F. L., and McJunkin, P.  
 Blackman, M. W., The Spermatogenesis of the Myriapods. IV. — On the Karyosphere and Nucleolus in the Spermatocytes of *Scolopendra subspinipes*, 329-344.  
 Blackwell, H. L., Dispersion in Electric Double Refraction, 645-668.  
 Bôcher, Maxime, On Harmonic Functions in Two Dimensions, 575-583.  
 Bowditch, C. P., Report of Treasurer, 823.  
 Brackett, H. D., Temporal Clauses in Herodotus, 169-232.  
 Brenke, W. C., On the Convergence and Differentiation of Certain Classes of Trigonometric Series, 832.  
 Bridgman, P. W., The Electrostatic Field surrounding Two Special Columnar Elements, 615-626, 811.  
 Bromide, Sodid, The Transition Temperature of, 433-448, 812.

- Butcher, Samuel Henry, elected Foreign Honorary Member, 808; accepts Membership, 810.
- Calorimetry, The Elimination of Thermometric Lag and Accidental Loss of Heat in, 1-19.
- Campbell, L. L. *See* Hall, E. H., Churchill, E. P., Campbell, L. L., and Serviss, S. B.
- Campbell, L. L. *See* Hall, E. H., Campbell, L. L., and Serviss, S. B.
- Canadian Petroleum, The Sulphur Compounds and Unsaturated Hydrocarbons in, 87-113.
- Canon, Walter Bradford, elected Resident Fellow, 819; accepts Fellowship, 822.
- Carbon Dioxide, Thermal Expansion of Hydrogen and, under Constant Pressure, 115-140.
- Carpenter, F. W. *See* Castle, W. E., Carpenter, F. W., Clark, A. H., Mast, S. O., and Barrows, W. M.
- Carver, Thomas Nixon, elected Resident Fellow, 819.
- Case School of Applied Science. *See* Chemical Laboratory of.
- Castle, W. E., Carpenter, F. W., Clark, A. H., Mast, S. O., and Barrows, W. M., The Effects of Inbreeding, Cross-Breeding, and Selection upon the Fertility and Variability of *Drosophila*, 729-786, 818.
- Central America, Descriptions of Spermatophytes from, 233-270.
- Chemical Laboratory of Case School of Applied Science, Contributions from, 87.
- Chemical Laboratory of Harvard College, Contributions from, 1, 71, 115, 397, 417, 433, 449.
- Chilovi, Desiderio, death of, 807.
- Churchill, E. P. *See* Hall, E. H., Churchill, E. P., Campbell, L. L., and Serviss, S. B.
- Clark, A. H. *See* Castle, W. E., Carpenter, F. W., Clark, A. H., Mast, S. O., and Barrows, W. M.
- Clark, A. L., Surface Tension at the Interface between Certain Liquids and Vapors, 359-381.
- Coffin, J. G., The Influence of Frequency upon the Self-Inductance of Coils, 787-803.
- Coils, The Influence of Frequency upon the Self-Inductance of, 787-803.
- Columnar Elements, The Electrostatic Field surrounding Two Special, 615-626, 811.
- Committees, Standing, appointed, 832; List of, 847.
- Conductivity, The Electrical, of Solutions in Liquid Iodine, 417-432.
- Conductivity, Thermal, A Method of Determining, 455-464, 812.
- Conductivity, Thermal, in Soft Iron between 114° and 204° C., On the Thomson Effect and the Temperature Coefficient of, 833.
- Conductivity, The Thermal, of Lead, 669-689, 812.
- Copeland, M. *See* Mark, E. L., and Copeland, M.
- Council, Report of, 823, 837; Financial Report of, 829.
- Craters, Comparison of Lunar and Hawaiian, 818.
- Cross, C. R., Report of the Rumford Committee, 826.
- Cross-Breeding, The Effects of, upon the Fertility and Variability of *Drosophila*, 729-786, 818.
- Cryptogamic Laboratory of Harvard University, Contributions from, 301.
- Current, On the Manner of Growth of a, in the Coil of a Nearly-closed Electromagnet as influenced by the Width of the Air Gap, 503-540, 809.
- Davenport, Charles B., elected Associate Fellow, 819.
- Davis, H. N., The Longitudinal Vibrations of a Rubbed String, 691-727, 809, 818.
- Davis, W. M., appointed delegate, 819; The Desirability of a General Annual Meeting of New England Investigators, 822; Notes on South Africa: The Dwyka Glacial Formation and the Karroo Basin Formation, 811.
- Delphi, 832.

- Dispersion in Electric Double Refraction, 645-668.
- Dolbear, A. E., resigns Fellowship, 811.
- Draper, F. W., resigns Fellowship, 822.
- Drosophila, The Effects of Inbreeding, Cross-Breeding, and Selection upon the Fertility and Variability of, 729-786, 818.
- Electric Discharges, 627-644.
- Electromagnet, On the Manner of Growth of a Current in the Coil of a Nearly-closed, as influenced by the Width of the Air Gap, 503-540, 809.
- Electrons, The Fluorescence of Sodium Vapor and the Resonance Radiation of, 809.
- Electrostatic Field, The, surrounding Two Special Columnar Elements, 615-626, 811.
- Entomophthoraceae, Contributions to the Cytology of the, 833.
- Ether and Alcohol in the Neighborhood of their Boiling Points, The Expansibility and the Compressibility of, 811.
- Ether, On the Coefficients of Compressibility and Expansion of, 833.
- Eupatorieae, Diagnoses and Notes relating to American, 271-278.
- Everett, William, resigns Fellowship, 810.
- Fairbanks, Arthur, Athenian Lekythoi with Outline Drawing in Glaze Varnish on a White Ground, 821.
- Fellows, Associate, deceased, — Langley, S. P., 819.
- Fellows, Associate, elected, — Pupin, Michael Idvorsky, 808.
- Fellows, Associate, List of, 853.
- Fellows, Resident, deceased, — Atkinson, Edward, 811.
- Bartlett, John, 811.
- Peirce, J. M., 822.
- Shaler, N. S., 822.
- Wood, E. S., 807.
- Fellows, Resident, elected, — Adams, C. A., 819.
- Beale, J. H. Jr., 819.
- Fellows, Resident, elected, — Bell, Louis, 808.
- Cannon, W. B., 819.
- Carver, T. N., 819.
- Francke, Kuno, 808.
- Gross, Charles, 808.
- Howard, A. A., 819.
- Jeffrey, E. C., 819.
- Kennelly, A. E., 808.
- Moore, G. F., 819.
- Warren, H. L., 808.
- Fellows, Resident, List of, 849.
- Fellows, Resident, transferred to Associate Fellowship, — Davenport, C. B., 819.
- Fernald, M. L., Soil and Climatic Control of Plant Distribution in Eastern America, 821.
- Fertility of Drosophila, The Effects of Selection upon, 729-786, 818.
- Fitzgerald-Lorentz Effect, Report of an Experiment to detect the, 319-327.
- Fluorescence of Fluorite, The, 585-613.
- Fluorescence of Sodium Vapor and the Resonance Radiation of Electrons, The, 809.
- Fluorite, Studies on, 585-613.
- Fluorspar, Gaseous and Liquid Inclusions in, 585-613, 809.
- Fluospar, The Thermo-Luminescence of, 809.
- Forbes, G. S. See Richards, T. W., Henderson, L. J., and Forbes, G. S.
- Foreign Honorary Members, deceased, — Kölliker, A. von, 815.
- Richthofen, Freiherr von, 810.
- Struve, Otto, 807.
- Foreign Honorary Members, elected— Butcher, S. H., 808.
- Ostwald, Wilhelm, 808.
- Foreign Honorary Members, List of, 855.
- Francke, Kuno, elected Resident Fellow, 808; accepts Fellowship, 810.
- Franco-American Expedition to explore the Atmosphere in the Tropics, Results of the, 818.
- Franklin Bicentennial Committee, Invitation from, 812.
- Functions, On Harmonic, in Two Dimensions, 575-583.



- Galvanometer, Mirror, On a Simple Device for measuring the Deflections of a, 822.
- Galvanometer, Moving-coil, On the Correction for the Effect of the Counter Electromotive Force of a, 821.
- Gases, Friction and Force due to Transpiration as Dependent on Pressure in, 812.
- General Fund, 823, 829; Appropriation from the Income of, 830.
- German-Silver, On Thermo-Electric Heterogeneity in Certain Alloys, especially, 541-574, 811.
- Goodwin, H. M., and Wentworth, H. A., On the Ionization of Fused Salts, 833.
- Goodwin, W. W., appointed delegate, 819; Delphi, 832.
- Gray Herbarium of Harvard University, Contributions from, 141, 233.
- Greenman, J. M., Descriptions of Spermatophytes from the Southwestern United States, Mexico, and Central America, 233-270.
- Gross, Charles, elected Resident Fellow, 808; accepts Fellowship, 810.
- Hall, E. H., Report of the Council, 823, 837; A Theory of Thermo-electric Action, 821.
- Hall, E. H., Campbell, L. L., and Serviss, S. B., On the Thomson Effect and the Temperature Coefficient of Thermal Conductivity in Soft Iron between  $114^{\circ}$  and  $204^{\circ}$  C., 833.
- Hall, E. H., Campbell, L. L., and Serviss, S. B., On Thermo-Electric Heterogeneity in Certain Alloys, especially German-Silver, 541-574, 811.
- Hall, E. H., Churchill, E. P., Campbell, L. L., and Serviss, S. B., Measurements of Various Thermal and Electrical Effects, especially the Thomson Effect, in Soft Iron, 21-55.
- Hall, G. S., resigns Fellowship, 807.
- Hall Effect, Titles of Articles on the, with the Titles of Some Articles on the Related Phenomena since discovered by other Investigators, 383-395, 809.
- Harmonic Functions in Two Dimensions, On, 575-583.
- Harvard University. See Chemical Laboratory, Cryptogamic Laboratory, Gray Herbarium, Jefferson Physical Laboratory, and Zoological Laboratory.
- Hay, G., On a Postulate respecting a Certain Form of Deviation from the Straight Line in a Plane, 351-357, 810; On the Inconsistency of the Axiom of the Plane with the Supposition that the Sum of the Angles of the Rectilinear Triangle is Less than  $180^{\circ}$ , 818.
- Henderson, L. J. See Richards, T. W., Henderson, L. J., and Forbes, G. S.
- Herodotus, Temporal Clauses in, 169-232.
- Hogg, J. L., Friction and Force due to Transpiration as Dependent on Pressure in Gases, 812.
- Honey Bee, Some Stages in the Spermatogenesis of the, 833.
- House Committee established, 814.
- Howard, Albert Andrew, elected Resident Fellow, 819.
- Hydrocarbons, The Sulphur Compounds and Unsaturated, in Canadian Petroleum, 87-113.
- Hydrogen, The Spectrum of, in the Schumann Region of Short Wave Lengths, 811.
- Hydrogen and Carbon Dioxide under Constant Pressure, Thermal Expansion of, 115-140.
- Inbreeding, Cross-Breeding, and Selection, The Effects of, upon the Fertility and Variability of *Drosophila*, 729-786, 818.
- Iodine, Liquid, The Electrical Conductivity of Solutions in, 417-432.
- Iodine, Revision of the Atomic Weight of, 71-85.
- Iron Particles, On the Permeability and the Retentiveness of a Mass of Fine, 818.
- Iron, Soft, between  $114^{\circ}$  and  $204^{\circ}$  C., On the Thomson Effect and the Temperature Coefficient of Thermal Conductivity in, 833.



- Iron, Soft, Measurements of Various Thermal and Electrical Effects, especially the Thomson Effect, in, 21-55.
- Iron, The Relative Positions of the Arc and Spark Lines of the Spectra of, 279-300.
- Jackson, F. G. *See* Richards, T. W., and Jackson, F. G.
- Jackson, R. F. *See* Lewis, G. N., and Jackson, R. F.
- Jefferson Physical Laboratory, Contributions from, 21, 503, 541, 585, 615, 627, 645, 691.
- Jeffrey, Edward Charles, elected Resident Fellow, 819; accepts Fellowship, 822.
- Jones, W. W., A Revision of the Genus *Zexmenia*, 141-167.
- Kennelly, Arthur Edward, elected Resident Fellow, 808; accepts Fellowship, 810.
- Kent, N. A., The Relative Positions of the Arc and Spark Lines of the Spectra of Titanium, Zinc, and Iron, 279-300.
- Kinnicutt, L. P., Report of the C. M. Warren Committee, 828.
- Kölliker, A. von, Death of, 815.
- Koristka, K. R. von, Death of, 814.
- Laboulbeniaceae, Preliminary Diagnoses of New Species of, 301-318.
- Langley, S. P., Death of, 819.
- Laws, F. A., Bishop, F. L., and McJunkin, P., A Method of determining Thermal Conductivity, 455-464, 812.
- Lead, The Thermal Conductivity of, 669-689, 812.
- Lecointe, G., Letter from, 812.
- Leidy, Dr. Joseph, Memorial to, 814.
- Lekythoi, Athenian, with Outline Drawing in Glaze Varnish on a White Ground, 821.
- Lewis, G. N., and Jackson, R. F., Galvanic Polarization on a Mercury Cathode, 397-415.
- Lewis, G. N., and Wheeler, P., The Electrical Conductivity of Solutions in Liquid Iodine, 417-432.
- Librarian, Report of, 825.
- Library, Appropriations for, 829.
- Library Committee, Report of, 830.
- Loudness, The Sense of, 811.
- Lowell, A. L., appointed Delegate, 808.
- Lyman, Theodore, The Spectrum of Hydrogen in the Schumann Region of Short Wave Lengths, 811.
- Mabery, C. F., On the Composition of Petroleum. — The Sulphur Compounds and Unsaturated Hydrocarbons in Canadian Petroleum. — By C. F. Mabery and W. O. Quayle, 87-113.
- Magnetic Field and Electric Discharges, 927-644.
- Mark, E. L., Report of the Publication Committee, 828. *See* Zoological Laboratory of the Museum of Comparative Zoology at Harvard College, Contributions from.
- Mark, E. L., and Copeland, M., Some Stages in the Spermatogenesis of the Honey Bee, 833.
- Mark, K. L. *See* Richards, T. W., and Mark, K. L.
- Massachusetts Historical Society, 831.
- Massachusetts Institute of Technology. *See* Physical Laboratory of Mass. Inst. of Technology.
- Mast, S. O. *See* Castle, W. E., Carpenter, F. W., Clark, A. H., Mast, S. O., and Barrows, W. M.
- McJunkin, P. *See* Laws, F. A., Bishop, F. L., and McJunkin, P.
- McKay, T. C., Titles of Articles on the Hall Effect, with the Titles of Some Articles on the Related Phenomena since discovered by Other Investigators, 383-395, 809.
- Mexico, Descriptions of Spermatophytes from, 233-270.
- Miller, D. C. *See* Morley, E. W., and Miller, D. C.
- Moore, George Foot, elected Resident Fellow, 819; accepts Fellowship, 822.
- Morgan, M. H., Notice of John Bartlett, 841; On the Language of Vitruvius, 465-502, 812.
- Morley, E. W., and Miller, D. C., Report of an Experiment to detect the Fitzgerald-Lorentz Effect, 319-327.

- Morse, H. W., Studies on Fluorite: (I) The Fluorescence of Fluorite; (II) The Thermo-Luminescence of Fluorite; (III) Gaseous and Liquid Inclusions in Fluorspar, 585-613, 809.
- Munroe, C. E., accepts Fellowship, 807.
- Museum of Comparative Zoölogy at Harvard College. *See* Zoölogical Laboratory.
- Myriapods, The Spermatogenesis of the, 329-344.
- Officers, elected, 830; List of, 847.
- Orthogonal Functions of  $x$  and  $y$ , On the Conditions to be Satisfied if the Sums of the Corresponding Members of two Pairs of, are to be themselves Orthogonal, 821.
- Ostwald, Wilhelm, elected Foreign Honorary Member, 808; accepts Membership, 822; The International Language, Esperanto, 810.
- Peirce, B. O., On a Simple Device for measuring the Deflections of a Mirror Galvanometer, 822; On the Correction for the Effect of the Counter Electromotive Force of a Moving-coil Galvanometer used Ballistically, 821; On the Conditions to be satisfied if the Sums of the Corresponding Members of two Pairs of Orthogonal Functions of  $x$  and  $y$  are to be themselves Orthogonal, 821; On the Length of the Time of Contact in the Case of a Quick Tap on a Telegraph Key, 818; On the Manner of Growth of a Current in the Coil of a Nearly closed Electromagnet as influenced by the Width of the Air Gap, 503-540, 809; On the Permeability and the Retentiveness of a Mass of Fine Iron Particles, 818.
- Peirce, J. M., death of, 822.
- Petroleum, On the Composition of, 87-113.
- Physical Laboratory of the Massachusetts Institute of Technology, Contributions from, 455.
- Pickering, W. H., Comparison of Lunar and Hawaiian Craters, 818.
- Pitch, Variation in Reverberation with Variation in, 821.
- Plane, On a Postulate respecting a Certain Form of Deviation from the Straight Line in a, 351-357, 310.
- Plane, On the Inconsistency of the Axiom of the, with the Supposition that the Sum of the Angles of the Rectilinear Triangle is less than  $180^\circ$ , 813.
- Plato's Republic, Studies in the Text of, 832.
- Polarization, Galvanic, on a Mercury Cathode, 397-415.
- Porzild, M. P., Letter from, 819.
- Postulate respecting a Certain Form of Deviation from the Straight Line in a Plane, On a, 351-357, 810.
- Publication, Appropriation for, 830.
- Publication Committee, 832; Report of, 826.
- Publication Fund, 824.
- Pupin, Michael Idvorsky, elected Associate Fellow, 808; accepts Fellowship, 810.
- Quayle, W. O. *See* Mabery, C. F.
- Records of Meetings, 807.
- Refraction, Dispersion in Electric Double, 645-668.
- Reverberation, Variation in, with Variation in Pitch, 821.
- Richards, T. W., and Jackson, F. G., A New Method of Standardizing Thermometers below  $0^\circ$  C., 449-454, 812.
- Richards, T. W., and Mark, K. L., Thermal Expansion of Hydrogen and Carbon Dioxide under Constant Pressure, 115-140.
- Richards, T. W., and Wells, R. C., The Transition Temperature of Sodid Bromide: a New Fixed Point in Thermometry, 433-448, 812.
- Richards, T. W., Henderson, L. J., and Forbes, G. S., The Elimination of Thermometric Lag and Accidental Loss of Heat in Calorimetry, 1-19. 1. Two New Methods of Avoiding Error in Calorimetry. By T. W. Rich-

- ards, 1-7. 2. The Constancy of Results obtained by one of the New Methods. By T. W. Richards and G. S. Forbes, 8-10.
3. The Comparison of the Two Methods, and the Exact Estimation of Adiabatic Rise of Temperature, 10-19.
- Richthofen, Freiherr von, Death of, 810.
- Riddle, L. W., Contributions to the Cytology of the Entomophthoraceae, 833.
- Robinson, B. L., Diagnosis and Notes relating to American Eupatorieae, 271-278, 821.
- Rotch, A. Lawrence, On the First Observations with Registration Balloons in America, 345-350; Report of Librarian, 825; Results of the Franco-American Expedition to explore the Atmosphere in the Tropics, 818.
- Royal Geographical Society of Australasia, Invitation from, 814.
- Rumford Committee, Report of, 826; Reports of Progress to, 828.
- Rumford Fund, 823; Appropriations from the Income of, 830; Papers published by Aid of, 1, 21, 115, 279, 319, 359, 433, 449, 455, 541, 585, 645, 669.
- Rumford Premium, 868.
- Sabine, W. C., The Accuracy of Musical Taste with Respect to Architectural Acoustics, 821; The Sense of Loudness, 811; Variation in Reverberation with Variation in Pitch, 821.
- Salts, Fused, On the Ionization of, 833.
- Scalar Functions of Hypercomplex Numbers, The, 57-70.
- Schumann Region of Short Wave Lengths, The Spectrum of Hydrogen in the, 811.
- Scolopendra subspinipes, On the Karyosphere and Nucleolus in the Spermatocytes of, 329-344.
- Selection, The Effects of, upon the Fertility and Variability of *Drosophila*, 729-786, 818.
- Self-Induction of Coils, The Influence of Frequency upon the, 787-803.
- Series, Trigonometric, On the Convergence and Differentiation of Certain Classes of, 832.
- Serviss, S. B. See Hall, E. H., Campbell, L. L., and Serviss, S. B.
- Serviss, S. B. See Hall, E. H., Churchill, E. P., Campbell, L. L., and Serviss, S. B.
- Shaler, N. S., Death of, 822.
- Smith, A. W., The Expansibility and the Compressibility of Ether and of Alcohol in the Neighborhood of their Boiling Points, 811; On the Coefficients of Compressibility and Expansion of Ether and Alcohol, 833.
- Sociedad Mexicana de Geografia y Estadistica, Invitation from, 810.
- Société d'Emulation d'Abbeville, Letter from, 823.
- Société Entomologique de Belgique, Letter from, 807.
- Sodium Vapor, The Fluorescence of, and the Resonance Radiation of Electrons, 809.
- Spectra of Titanium, Zinc, and Iron, The Relative Positions of the Arc and Spark Lines of the, 279-300.
- Spermatogenesis of the Myriapods, 329-344.
- Spermatophytes from the Southwestern United States, Mexico, and Central America, Descriptions of, 233-270.
- Standing Committees, appointed, 832; List of, 847.
- Standing Votes, 867; Amendment of, 813, 815.
- Statutes, 857; Amendment of, 812, 815.
- Straight Line in a Plane, On a Postulate respecting a Certain Form of Deviation from the, 351-357, 810.
- Struve, Otto, Death of, 807.
- Sulphur Compounds and Unsaturated Hydrocarbons in Canadian Petroleum, 87-113.
- Surface Tension at the Interface between Certain Liquids and Vapors, 359-381.
- Taber, Henry, The Scalar Functions of Hypercomplex Numbers, 57-70.

- Telegraph Key, On the Length of the Time of Contact in the Case of a Quick Tap on a, 818.
- Thaxter, Roland, Preliminary Diagnoses of New Species of Laboulbeniaceae, — VI., 301-318.
- Thermal Conductivity, A Method of Determining, 455-464, 812.
- Thermal Conductivity in Soft Iron between  $114^{\circ}$  and  $204^{\circ}$  C., On the Thomson Effect and the Temperature Coefficient of, 833.
- Thermal Conductivity of Lead, 669-689, 812.
- Thermal Expansion of Hydrogen and Carbon Dioxide under Constant Pressure, 115-140.
- Thermo-electric Action, A Theory of, 821.
- Thermo-electric Heterogeneity in Certain Alloys, especially German-Silver, 541-574, 811.
- Thermo-Luminescence of Fluorite, The, 585-613.
- Thermometers, A New Method of Standardizing Thermometers below  $0^{\circ}$  C., 449-454, 812.
- Thermometry, A New Fixed Point in, 433-448, 812.
- Thomson Effect and the Temperature Coefficient of Thermal Conductivity in Soft Iron between  $114^{\circ}$  and  $204^{\circ}$  C., On the, 833.
- Thomson Effect in Soft Iron, Measurements of Various Thermal and Electrical Effects, especially the, 21-55.
- Titanium, The Relative Positions of the Arc and Spark Lines of the Spectra of, 279-300.
- Tomek, W. W. Ritt. von, Death of, 807.
- Transition Temperature of Sodid Bromide, 433-448.
- Treasurer, Report of, 823.
- Trelease, W., appointed Delegate, 814; Letter from, 822.
- Trowbridge, John, Effect of Magnetic Field on Production of the X-Rays, 813; Slow Discharges of Electricity, 809; Electric Discharges. (I) Slow Moving Electrical Luminous Effects; (II) Magnetic Field and Electric Discharges, 627-644, 810.
- United States, Descriptions of Spermatophytes from the Southwestern, 233-270.
- University of Illinois, Invitation from, 807.
- Variability of *Drosophila*, The Effects of Selection upon, 729-786, 818.
- Vibrations of a Rubbed String, The Longitudinal, 691-727, 809, 818.
- Vitruvius, On the Language of, 465-502, 812.
- Ware, William R., Notice of J. M. Barnard, 811, 837.
- Warren (C. M.) Committee, Report of, 828.
- Warren (C. M.) Fund, 824; Appropriation from the Income of, 830; Papers published by Aid of, 87.
- Warren, Herbert Langford, elected Resident Fellow, 808; accepts Fellowship, 810.
- Wave Lengths, Short, The Spectrum of Hydrogen in the Schumann Region of, 811.
- Wells, R. C. See Richards, T. W., and Wells, R. C.
- Wendell, Barrett, The Universities of France, 821.
- Wentworth, H. A. See Goodwin, H. M., and Wentworth, H. A.
- Wheeler, P. See Lewis, G. N., and Wheeler, P.
- Williston, Samuel, accepts Fellowship, 807.
- Wood, Edward S., Death of, 807.
- Wood, R. W., The Fluorescence of Sodium Vapor and the Resonance Radiation of Electrons, 809.
- Wright, J. H., Studies in the text of Plato's Republic, 832.
- Zexmenia, A Revision of the Genus, 141-167.
- Zinc, The Relative Positions of the Arc and Spark Lines of the Spectra of, 279-300.
- Zoological Laboratory of the Museum of Comparative Zoology at Harvard College, E. L. Mark, Director, Contributions from, 729.

dilute solutions we have shown to be negative, becomes numerically smaller with increasing concentration, is zero when  $C$  is a little less than 3.0 and for stronger solutions becomes positive. The conductivity curve for any other neighboring temperature is therefore very similar to the one for  $140^\circ$ , but crosses that curve at a concentration of about 3. The change in sign of the temperature coefficient might perhaps have been predicted, for with increasing concentration the substance approaches more and more nearly the condition of a pure molten salt and all salts which have been hitherto studied have large positive temperature coefficients.

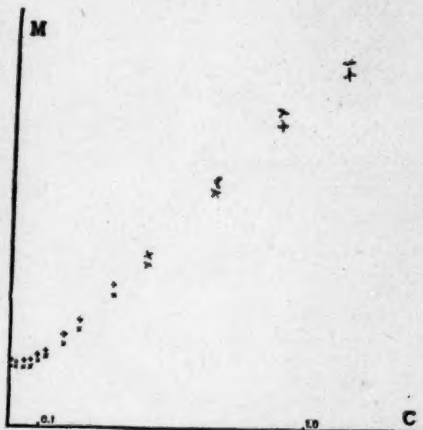


FIGURE 2.

Table V gives the percentage change in the conductivity, per degree, at several concentrations.

TABLE V.

C.	Temperature coefficient.
	per cent.
0.1	-0.46
0.4	-0.38
2.8	$\pm 0$ .
8.8	+0.80
20.0	+0.55
28.1	+0.67

#### DISCUSSION OF THE CONDUCTIVITY CURVE.

Assuming that the whole of the conductivity is electrolytic in character, let us consider from this point of view, the curves of Figures 2



and 3, especially the former, which embraces the region of dilute solutions. Here we may regard  $M$  as proportional to the molecular conductivity and, assuming the mobility of the ions to be constant, to the degree of dissociation. The latter quantity, instead of rising with increasing dilution and approaching a constant maximum as in the case of water solution, has a maximum in the neighborhood of  $C = 5$ , and from that point decreases rapidly with increasing dilution.

This behavior has been previously noticed by a number of observers in the case of certain organic solvents and other solvents of *small dissociating power*. It is our belief that this is an extreme manifestation of a phenomenon which is common to all solutions and which has been frequently observed in aqueous solutions.



FIGURE 8.

The mass law applied to the dissociation of a binary electrolyte gives the equation  $K C_1 = C_2^2$  where  $C_1$  is the concentration of the undissociated substance and  $C_2$  that of one of the ions. It is well known, however, that this equation is not satisfied in the case of all water solutions. Bancroft\* has shown that the empirical equation  $K C_1 = C_2^n$ , where  $n$  is a specific constant depending on the nature of the electrolyte, expresses satisfactorily the behavior of any aqueous solution. This quantity  $n$  varies from 2 in the case of weak acids and bases down to 1.36 in the case of potassium chloride. If now we could find some still "stronger" electrolyte than potassium chloride, the value of  $n$  would doubtless be still smaller. If a substance could be found with a value of  $n$  less than 1 the degree of dissociation and consequently the molecular conductivity would increase with the concentration as they do in the case we have been studying.

\* Zeit. phys. Chem., 31, 188 (1899).



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JAMES MUNSON BARNARD. BY WILLIAM R. WARR.  
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OFFICERS AND COMMITTEES FOR 1906-1907.

LIST OF THE FELLOWS AND FOREIGN HONORARY MEMBERS.

STATUTES AND STANDING VOTES.

RUMFORD PREMIUM.

INDEX.

(TITLE PAGE AND TABLE OF CONTENTS.)

# VOLUME 22.

1. HENNING, E. L. — Studies in the Eupatoriaceae: (I.) Revision of the Genus *Eupatoria*; (II.) Revision of the Genus *Oparysperma*; (III.) The Genus *Holognes* and its Synonymy; (IV.) Diagnosis and Synonymy of Eupatoriaceae and of Certain Other Compositae which have been Classed with them. pp. 1-43. May, 1906. 30c.
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